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THE SAFE LIMIT OF CARBON DIOXIDE IN THE WORKING ATMOSPHERE.

G. O. Higley,
Professor of Chemistry, Ohio Wesleyan University, Delaware, Ohio.

THE preparation of the following résumé was suggested by the fact that there is an apparent lack of harmony between the generally accepted standard of permissible carbon dioxide in the working atmosphere and the conclusions of modern investigators regarding the effects of the inhalation of this gas.

That air containing excessive respiration products is unwholesome was known to Mayow (1). That investigator discovered oxygen, showed that this gas, "nitro aerial gas," is present in air and is consumed both in respiration and in combustion. Fifty years later Hales (2) showed that air is polluted by a deleterious substance given off from the lungs and which may be absorbed by potash, and the air thereby rendered more suitable for respiration, while, still later, Black (3) proved that this gas is carbon dioxide. The rediscovery of oxygen by Priestly and the light subsequently thrown upon the nature of respiration and of combustion by Lavoisier (4) enabled the hygienist for the first time to make an intelligent study of the problem of ventilation. Priestly (5) showed that carbon dioxide is poisonous, speedily causing the death of an animal confined in it. It was discovered later that this gas under these conditions is irrespirable, causing suffocation by closing the glottis. It was shown still later that the concentration of carbon dioxide in air must be very high before death results from inhaling it. Thus Paul Bert showed that when small animals such as rats and young rabbits are confined in a volume of air from five to thirty times the body volume of the animal, death did not occur in some cases for several hours. Also an analysis of the residual air of the chamber showed, on an average, about 3 per cent of oxygen and 15 per cent of carbon dioxide. It is probable that death was caused in these cases by lack of oxygen and not by the accumulated carbon dioxide, as the blood of the animals was venous. When, however, Bert (6) repeated his experiments,

employing instead of ordinary air an air containing 50 to 75 per cent of oxygen, death resulted when the carbon dioxide in the chamber had risen to about 25 per cent, *i. e.*, when from 25 to 50 per cent of oxygen still remained in the air of the chamber. These experiments proved that carbon dioxide caused death in these cases, since the blood of the animals at death was generally arterial. In some of Bert's experiments the arterial blood of his experimental dogs was found to contain at death 116 volumes per cent, and the venous blood 120 volumes per cent of carbon dioxide. This gas, therefore, can not be considered a quick or a violent poison. Indeed, Mosso (7) claims, as a result of numerous experiments carried out under greatly diminished pressure in a respiratory chamber or at great elevations in the Alps, that the animal system is so adjusted to the presence of a certain per centage of carbon dioxide in the arterial blood that a greater disturbance in health and comfort results from a deficiency, than from a corresponding excess of this gas in the blood.

It is undoubtedly true that the early hygienists regarded the discomfort and ill health resulting from rebreathing air as due to chemical causes, viz., deficient oxygen and excessive carbon dioxide. The first of these theories was abandoned when it was learned that defibrinated blood may be completely saturated with oxygen in contact with air containing 14 per cent or less of that gas, a figure that is generally far exceeded in the most highly polluted air. As regards the latter theory, it was early held that expired air contains subtle organic poisons as well as carbon dioxide. This theory was apparently borne out by the fact that unpleasant odors are usually in evidence in air that is much polluted by respiration. But as the nature and methods of determination of these poisons were unknown, while carbon dioxide could be quickly and accurately determined, hygienists contented themselves with assuming that the percentage of the latter was an accurate criterion of the purity of air. The safe limit of carbon dioxide in the working atmosphere was, after numerous experiments, fixed by Pettenkofer and others at amounts varying from .07 per cent to 0.1 per cent.

That chemical factors cause the ill effects resulting from breathing air charged with respiration products was generally accepted until within the last thirty years. Hermans (8) in 1883 seems to have been the first to suspect that the physical factors, temperature and humidity, might be of greater importance than the chemical factors in determining the quality of air; working with human subjects, who re-breathed air until its oxygen fell to 14.4 per cent, Hermans came to the following conclusions: (1) that no organic poisons are present in exhaled air; (2) that if the subject were cleanly in clothing and in person no odorous substances were given off; (3) that the gaseous exhalations from the lungs were without effect on the comfort or the health of the subject, even when the carbon dioxide in the chamber rose to 5.3 per cent; (4) that the axillary temperature of the subject rose as much as 1.1 degrees Fahrenheit as a result of a two-

hours' stay in a crowded room; (5) that ventilation is necessary mainly to sweep out dust particles and micro-organisms, and to keep down the air temperature and humidity, the actual causes of the ill effects of breathing the air of crowded rooms.

Flügge (9), Paul and Ercklentz (1905), with a somewhat improved method, showed that Hermans' conclusions were in the main, correct; that when the temperature of their experimental chamber was kept at 50° to 62° Fahrenheit with a relative humidity of 50 per cent, while the carbon dioxide rose to 1.6 per cent at the close of their three and a half hours experiment, not the slightest unfavorable result was noted; that this was true, even in the case of subjects having chronic bronchitis, asthma, emphysema, mitral insufficiency, or nephritis with hypertrophied heart; also, that when the room in which a teacher and fifty to sixty pupils were working was kept wholly without ventilation for three hours at a temperature below 62° Fahrenheit with a relative humidity of 50 per cent, teacher and pupils proceeded with their work apparently wholly unaffected by the accumulated carbon dioxide in the air and with unimpaired capacity for doing mental work.

Flügge (10) states that Hermans' investigations bore valuable fruit, as several authors embodied in their works some of the principles established by him in this research. Thus Rietschel, in his "Principles of Ventilation" which appeared in 1893, mentioned the importance of keeping down the temperature of the air of a room as well as of removing chemical poisons. Also Krieger (1899) in a work on the value of ventilation makes the following statement: "The value of ventilation for the purpose of introducing fresh air into dwellings, schoolrooms and hospitals is not as great as is generally supposed. Much more important is ventilation in the establishment of a proper temperature and air movement as well as for the regulation of the humidity."

Flügge laments the fact that the German hygienists had for twelve years overlooked the importance of Hermans' work and that it was in so few places being put into practice.

Various investigators, Haldane, Hill, Benedict, and others have confirmed the conclusions of Hermans and Flügge.

An important recent investigation is that of the "Chicago Commission of Ventilation," the report of which appeared in 1914. One aim of this commission was "to conduct such experiments as will make the practice of ventilation a branch of applied science." Elaborate and careful studies were made of the ventilation of picture theaters, schoolrooms, and other buildings. Some of the conclusions of this commission are as follows:

1. That carbon dioxide as encountered in working practice is not the harmful agent of major importance in expired air or in air otherwise contaminated.

2. That in those processes of manufacture where considerable carbon dioxide is liberated, the carbon dioxide content is not a proper index of air pollution.

3. That in street cars, elevated cars,

etc., the carbon dioxide content of the air should not rise above .12 per cent.

4. That a temperature of 68° Fahrenheit, with a proper relative humidity, is the best maximum temperature for living rooms artificially heated.

5. That from the standpoint of health, relative humidity is one of the important factors in ventilation.

6. That efficient air cleaning devices are desirable in all ventilating installations where the air supply is liable to be contaminated by dust or other objectionable matter.

7. That the bacterial content of the air is an important factor in all ventilation, and bears a direct relation to the source and quantity of air supply.

8. That the temperature of a schoolroom should be kept as low as the comfort of the occupants will permit; and that the temperature may be maintained lower with comfort by increasing the relative humidity.

The commission worked out, also, a valuable "Comfort Zone" chart.

In 1915 there appeared the paper on "Some results of the first year's work of the New York State Commission on Ventilation" (11). The findings of this commission are especially trustworthy and valuable for various reasons: (1) the work was planned and carried out by seven experts in seven related fields, while previous work on this subject generally has been conducted by one investigator; (2) the apparatus employed was more complete and perfect than that previously used in such work; (3) the number of subjects studied and the length of experiments were both greater than ever before; (4) the physiological and psychological condition of the subjects were very fully noted; (5) the effects of various temperatures and degrees of humidity were noted.

Results: I, The conclusions of Hermans, Flügge, Hill, and others were confirmed in regard to the importance of the physical factors of temperature, humidity of air, and air movement; II, Parallel experiments conducted for the purpose of comparing the effect on their subjects of pure air with that of air containing from .1 to 1.3 per cent of carbon dioxide, temperature and humidity being the same throughout, showed: (1) that the subject seemed about equally comfortable in pure and in stagnant air; (2) that body temperature, heart rate, increase of heart rate on standing, blood pressure, Crampton value, and respiration of the subject were practically the same in pure and in stagnant air; (3) that the chemical condition of the air had no perceptible influence on the amount and accuracy of mental and physical work; (4) that the quantity of food eaten by a subject was slightly less in stagnant than in pure air.

Lee and Scott (12) have recently found in experiments on the excised muscles of cats that had been kept for some hours under definite conditions of air temperature and humidity, that the capacity for work of the muscles varied with the conditions. Thus, the work done by a muscle from an animal which had been kept under comfortable conditions (69° Fahrenheit and 52 per cent relative humidity) was about 33 per cent higher than that done by the corresponding muscle from an animal kept at 91° Fahrenheit with a relative

humidity of 90 per cent. These results illustrate well the deleterious influence on nervous and muscular tissues of high temperature combined with very high humidity.

Cocks (13) has shown in work on human subjects, using an improved Glatzel metallic mirror, that the continuous breathing of hot, dry air, or of hot, moist air, leads to serious respiratory trouble, atrophic rhinitis being noted in 35 per cent and 45 per cent respectively of the cases under the conditions just noted.

The conclusions of investigators seem then, to be about as follows: In the opinion of Flügge one may breathe for several hours air containing twenty times the usual permissible percentage of carbon dioxide without perceptible deleterious influence upon his health.

The more rigorous methods of the New York State Commission for Ventilation reveal the fact that stagnant air containing two to fifteen times the generally accepted amount of carbon dioxide may be respired seven hours per day for five or more weeks with no perceptible effect upon heart rate, on increase of heart rate on standing, on blood pressure, Crampton value, or respiration of the subject.

On the other hand, all the deleterious effects that were formerly attributed to respiring carbon dioxide present in stagnant air may be produced by breathing, for the same period, air that is practically free from carbon dioxide but which has a temperature of say 90° Fahrenheit and a very high relative humidity.

Also that a cold, dry air when heated to 80° or more without humidification may produce, when respired for some time, the deleterious results so beautifully demonstrated by Cocks.

The matter is well summed up by Professor Lee when he says that "the problem of ventilation is physical rather than chemical, cutaneous rather than respiratory."

In view, then, of the fact that recent investigations have apparently shown carbon dioxide to be harmless when respired in much larger amounts than .08 per cent, the writer would suggest that the safe limit of this gas in the working atmosphere be placed at .2 per cent.

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13. Conducted under the auspices of the New York State Commission on Ventilation. Read before the American Laryngological Rhinological and Otological Society, at the Twenty-first Annual Meeting, in Chicago, June 15–16, 1915.

A MATERNITY AND INFANT WELFARE PROGRAM FOR THE UNITED STATES.

J. H. Larson,
Secretary, Committee for the Reduction of Infant Mortality of the New York Milk Committee.

Read before the Public Health Administration Section, October 17, 1917, at Washington, D. C.

"LONDON, May 8.—England will shortly add another ministry to its 'win-the-war' government—a ministry of health.

" 'One of England's greatest needs today is the formation of such a ministry,' Lord Rhondda, chairman of the Local Government Board, told the United Press today. 'Fifty thousand babies alone can be saved to the country through its control. Under the present system there is a large amount of overlapping in governmental work, leading to friction, unnecessary expense and waste of energy. I estimate that one national bill alone, enforcing government supervision of maternity and infant welfare, will save fifty thousand young lives a year. Such a bill will be introduced at an early date.' "

"A German Dispatch via Copenhagen, May 27.—The decrease in births was accompanied by a corresponding fall in the death-rate of infants under one year old, which was 13.3 per cent per hundred births, but this has not diminished the anxiety of the sociological experts, who are holding congresses to awaken popular interest in this menace to Germany's future. The Government is devoting intensive study to the repopulation problem through commissions attached to the Minister of the Interior and shortly will introduce legislation in the Reichstag to counteract the nation's falling rate of growth by measures calculated to stimulate the birth-rate and lower infant mortality."

Major Edward Rist of France is now in this country to acquaint himself as to what is being done here by public and private agencies in the way of life and health conservation. From this it appears that after three years of war, Great Britain, France and Germany, as well as other warring nations, are realizing the necessity of conserving its potential citizenship of the future. These Nations hope that by intensive methods of maternal, infant and child conservation, enough lives can be saved above those saved by ordinary methods in times of peace to replace in a few years the man power lost because of the war.

Such tardy recognition of a necessity of this magnitude should not be permitted in the United States if we are to survive the termination of the present conflict to our best national advantage. It behooves us at this time, when we are drafting our young manhood into actual military service, to take immediate steps in formulating and inaugurating a national program working towards conserving our man power of the future. A program of this kind should include:

(1) Prenatal nursing and maternity clinic service coördinated with the highest standard of obstetrical service obtainable.

(2) Nursing care for mother and

child during confinement, with rigid observation of rules and conduct prescribed by our highest medical authorities.

(3) See that every birth is officially reported to the proper authorities.

(4) Home visiting and clinical supervision by physician and nurse of mother and child, for one month after confinement with frequent and thorough physical examinations.

(5) Registering the mother and child at a babies' milk station or clinic with home visiting when necessary until the child is two years of age.

(6) Nursing and medical supervision of child during its pre-school age.

(7) Making available to all children of school age physical examination and medical supervision.

(8) Strengthen, rather than relax, our child labor laws and insisting upon a definite mental and physical standard with satisfactorily completed school work before working papers are issued.

This is a program of no mean proportions. In many places in this country where infant and child welfare activities have not been undertaken by either private or public initiative, it will require a great deal of time and effort for organization, equipment and getting the work under way. In other centers, such as the large cities in which the last decade has shown tremendous progress in preventive effort along these lines, the work will be comparatively simple. In New York City, for instance, the milk stations, public and private, cover nearly all the areas where reside mothers whose infants need milk station supervision. Similar activities provide care in a large measure, though not adequately, for children of pre-school age. The public school inspection is thorough and complete. Physical examination of school children by the Department of Health is of a high standard and effective. The child labor laws are enforced and public sentiment has so far prevented commercial greed from being successful in its attempt to relax these laws through legislation.

In the list enumerated, the most significant items and those deserving of the highest character of intensive effort are those which have for their objective the prevention of unnecessary loss of maternal and infant life, and it is for such a program that a national plan of action is here proposed. It has been pointed out by the Federal Children's Bureau that maternal deaths from causes due to pregnancy and confinement in the United States are exceeded only by deaths from tuberculosis. Among the so-called progressive nations of the world, the United States ranks fourteenth in its annual loss of mothers from causes due to pregnancy and confinement. This fact is rather disconcerting when it is pointed out that the total number of nations included in this group is only sixteen. The maternal death-rates per 100,000 of the general population ranges from the maximum of 19.6 for Spain (United States 14.9) down to 6.0 for Sweden.

The national problem confronting us in considering a preventive program of this kind cannot be stated with statistical accuracy. From our census and vital statistics, however, it is at least possible to get an approximate idea of its magnitude.

Out of every 1,000 pregnant mothers in New York City in 1916, 5 died from causes due to pregnancy and confinement, 43 gave birth to stillborn infants and 35 lost their babies through death during the first month after birth. Of the 18,000 potential lives that did not survive till the end of the first year after birth, over one-third were born dead, nearly one-third died during the first month after birth, and one-third during the remaining eleven months of the first year. This means that two-thirds of this sacrifice took place during the utero-gestation period and during the first month after birth.

A very conservative estimate may place the annual number of pregnancies in the United States at 2,650,000. Out of this number 15,000 of these mothers will lose their lives from causes due to pregnancy and confinement; 150,000 will give birth to dead babies; another 115,000 will lose their babies through death during the first month after confinement. This is an annual loss of 280,000 lives which is a direct annual tax upon the business of American Motherhood. That in brief is our national problem.

Given a practical working-program what can we hope to accomplish in the way of minimizing this loss? It has been conclusively demonstrated that stillbirths can be reduced 22 per cent and deaths under one month 28 per cent. Out of a total of 3,145 expectant mothers under the care of the New York Milk Committee, only five or 1.5 per 1,000 mothers died. The maternity death-rate throughout New York City was three times the rate that this experiment in prenatal care attained. And among the sixteen leading countries of the world the maternity death-rate per 100,000 population ranges from 6.0 to 19.6. In this list the United States ranks fourteenth with a rate of 14.9.

That the above percentage reductions are far from impossible has been proven by the statistical evidence of organizations which have worked along these lines. Their general attainment requires only that intelligent conservative prenatal, obstetrical and infant care effort during the utero-gestation period and the first month after birth be extended to all the mothers and babies in need of this care. National application of these possible reductions means saving 10,000 out of the present toll of 15,000 mothers. It means preventing 33,000 out of the 150,000 stillbirths. It means preventing 32,000 out of the 115,000 deaths under one month. Out of the present sacrifice, then, of 280,000, we should at least be able to salvage 75,000 lives.

Though it may sound utopian, this estimate is really very conservative. It exceeds Lord Rhondda's estimate numerically only. His proposed saving of 50,000 lives is out of a population of less than 50,000,000, while our proposed saving of 75,000 is out of a population of more than 100,000,000. And it can be done, if the public in general and the medical profession in particular will remember that an infant is nine months old when it is born, and that it needs expert care during this period even more than it does after birth. All of our eminent pediatrists are agreed that frequent and thorough physical examinations during the first month

after birth will discover and prevent a large number of the ailments which cause deaths of infants during the period immediately following birth.

In many communities there are now milk stations and other baby welfare agencies organized to prevent baby deaths, but very few babies are enrolled at such stations until after they are one month of age. (In New York City the average age of babies when registered at milk stations is three and one-half months.) Furthermore, these activities are very largely limited in scope to feeding problems, and are therefore comparatively simple, due, as is shown above, to the fact that only one-third of these potential baby lives survive until the milk station age is reached. The more difficult problem of conservation, as well as the more important, is to inaugurate a program which will, in a measure, prevent the unnecessary sacrifice that is now taking place during the utero-gestation period and the first month after birth.

To provide adequate maternity care for that large group of mothers in which the milk station is especially interested requires practically only the coördination of existing agencies to make this service available. Prenatal conditions, however, have no respect for class or financial position so that it will be necessary, through propaganda and education, to get every expectant mother interested in herself and the future welfare of her infant. The great middle class of the population is the backbone of this or any other nation. It is a notorious fact that it is only the very poor and the very rich that can get the best medical service available—the poor because they can get this service free—the rich because they can pay for this service, not only for themselves but for the poor as well. The average home, however, can afford only the average medical talent, and it is here that the greatest future progress lies in a campaign of this kind. But even among these it is going to be a comparatively simple matter in large centers of population because agitation along these lines has been under way for a number of years. Even here, as well as in all outlying districts, the necessity of carrying the message of mother and child conservation into every home through intensive organization is imperative.

Our country is now definitely committed to a policy of forcibly resisting aggression against democracy. The future of the United States, as well as the other warring nations, lies in the babies that are born today. Baby saving abroad has become almost as serious a problem as the war itself. It is more urgent now than ever before that all our efforts to prevent unnecessary loss of infant and maternal life be extended and intensified. The future has its need for the child of today, in the home, on the farm, in the workshop, the office and various parts of trade. We, as a nation, owe to those of our young manhood who gladly will sacrifice their lives on the field of battle, the rearing of sturdy successors to carry on their abandoned work in times of peace.

In order to accomplish this we must inaugurate a comprehensive national program to make the experience and

knowledge we already have in prenatal and maternity care available to every expectant mother in the nation, and nursing care to all babies until they are one month old when they can be registered at milk stations or other baby welfare agencies.

Nothing has been said of our present standard of obstetrical practice. We all know that, as a national proposition, this practice is far inferior to what it should be. However, it is a demonstrated fact that prenatal care and supervision alone automatically raises the standard of obstetrical practice both among the physicians and the midwives. Though we should urge standardization of training along these lines in all the medical colleges, hospitals, and schools for midwives, the program proposed will in itself make this work more efficient among the general practitioner of obstetrics.

OUTLINE OF PURPOSE, SCOPE AND ORGANIZATION OF A NATIONAL PROGRAM FOR MATERNITY AND INFANT WELFARE.

1. *Purpose.*

(a) Prevent unnecessary maternal deaths from causes due to pregnancy and confinement.

(b) Prevent unnecessary death and sickness in early infancy.

(c) Prevent unnecessary still and premature births.

(d) Conserve the health of the mother and thus reduce invalidism.

(e) Promote intelligent motherhood and maternal nursing.

(f) To place all babies under the influence of milk station or other Baby Welfare Agencies as early as possible.

2. *Scope and Character.*

(a) Registration of expectant mothers as early in pregnancy as possible.

(b) Mothers to remain under active supervision and care until one month after confinement.

(c) Expectant mothers should be urged to attend a maternity clinic every two weeks up to the eighth month and every week thereafter.

(d) If after being visited by the visiting nurse the mother fails to report to the clinic she should be visited in her home by the physician in charge of the clinic.

(e) Every patient should bring a specimen of urine for examination at each visit.

(f) Every patient should be given a copy of Instructions to Expectant Mothers or a copy of Prenatal Care published by the Children's Bureau.

(g) Complete record of services rendered and care given each mother should be maintained by use of uniform prenatal history card and physical examination card.

(h) Provide instruction in hygiene of pregnancy and the care of the new born infant.

(i) Provide special medical care and supervision for all abnormal cases.

(j) Provide adequate care at confinement.

(k) Provide through the coördination of all agencies interested any other care or help that the mother or her family may require.

(l) Provide a clinic where midwives may bring their cases and get expert advice.

3. *Organization.*

(a) A small National Committee organized as a sub-committee of the Federal Council on National Defense, with headquarters at Washington, D. C. This Committee to be responsible for inaugurating a national program of maternity and infant welfare.

(b) To duplicate this National Committee in each state in the Union, each state Committee being a sub-committee of the National Committee.

(c) Each state committee to appoint as many sub-committees as are necessary to adequately extend the work into every community in the state.

(d) Communities should be divided into zones with a central registration office, where should be registered all expectant mothers receiving maternity care by the various hospitals and organizations in that zone.

(e) Each such central registration office should report according to uniform tabulations the essential statistics of its work.

(f) These reports to be sent to the central office of the state and there tabulated for the state as a whole.

(g) These state reports should be sent to the national central office and there tabulated for the nation in order that we may have national statistics on this work.

SANITARY MOISTENERS FOR POST OFFICE LOBBIES.

WARREN E. FORSYTH.

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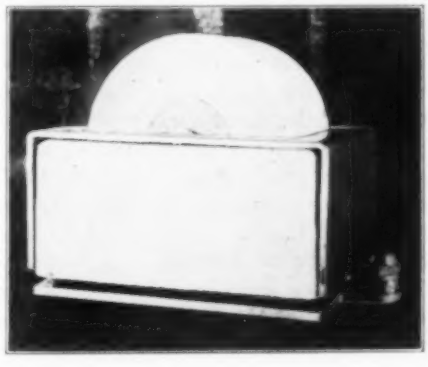
The common custom of licking stamps must have struck many as being insanitary. This is particularly noticeable in the lobby of almost any post office. The repeated offense of the writer's sanitary sense in this manner caused him to direct the installation of two suitable moisteners in a postal sub-station frequented by students of the University of Michigan. The moisteners were installed by the University Health Service and are kept in order willingly by the post office officials. The observed popularity of the moisteners prompts me to suggest their more general use. They might well be supplied to all post offices as part of their equipment. The accompanying clipping suggests a layman's notion of the danger of licking stamps.

BENTON HARBOR, MICH., Jan. 26.—Charles Pease, of this city, lies at the point of death from poisoning by mucilage on envelopes. Mr. Pease is suffering from a badly swollen mouth and throat. He had a dozen letters to mail and after moistening six of them noticed his tongue was burning and the muscles of his throat became paralyzed.



THE MOISTENER.

The common porcelain roller mounted in a porcelain trough was used. To prevent its undesired removal or accidental disturbance it was secured to the lobby table. The roller and trough are secured by a metal cover and bolts requiring a special wrench for their removal. The moisteners can be easily removed for an occasional cleaning. Water or other suitable solution can be added without removing the holder.

A STUDY OF PELLAGRA IN THE MORTALITY EXPERIENCE OF THE METROPOLITAN LIFE INSURANCE COMPANY, 1911–1916.

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Read before the Annual Meeting of the American Public Health Association, Section on Vital Statistics, Washington, D. C., October 19, 1917.

IN recent years pellagra has very rapidly increased in importance as a cause of death. This and the still unsettled question as to the causes of the disease, both strongly suggest the need for further statistical study of the facts that are at hand. By displaying some of the characteristics of the disease such as its relative prevalence as a cause of death among white and colored people or with reference to the two sexes or at the several age periods, it is possible for the statistician to aid the laboratory and clinical experts in their efforts. The statistical experience of the Industrial Department of the Metropolitan Life Insurance Company is especially valuable in this connection. The operations of the Company cover a very large part of the pellagrous area of the country. In all, several million lives in the cities and towns of the southern states are included, white as well as colored persons, males as well as females, children as well as adults. Every group of the population, excepting infants under one, is fully represented. Every death that occurs, moreover, in this experience is adequately and fully reported as to cause, color, sex and age, and the corresponding facts of the living population, that is, of the insured persons, are known with a completeness which is difficult to obtain in population vital statistics. It is possible, therefore, to present a series of tabulations giving death-rates for pellagra by color, sex and age period. The data, moreover, cover a period of six years, from 1911 to 1916, during which time pellagra has greatly increased in its incidence.

In this experience 2,310 deaths from pellagra are recorded. Table I presents the death-rates per 100,000 exposed, classified by color, sex and age period.

The combined death-rate, 4.3 per 100,000 exposed, is about the same as for angina pectoris and ulcer of the stomach and is higher than for any one of many diseases or for conditions which are universally recognized as important causes of death; for example, erysipelas, malaria, Pott's disease, general tuberculosis, the deadly epidemic cerebrospinal fever, epilepsy, gallstones, and others. Yet it is only a comparatively few years ago when a death from pellagra was considered a rarity in this country. In 1900, only two deaths from this disease were recorded in the Registration Area of the United States.

PELLAGRA MORE PREVALENT WITH ADVANCING AGE.

Table I indicates clearly that pellagra has its lowest incidence as a cause of death in the ages of childhood; in fact, the number of deaths among white children under 15 is negligible. Colored children show a larger number of cases. After age 15 the rates increase regularly until the age period 55 to 64 years is reached. From this point onward the rate falls slightly. It is, of course, possible that the data after age 65 have not the same merit as for the previous age periods because of the smaller number of persons exposed at these ad-

TABLE I.

MORTALITY FROM PELLAGRA CLASSIFIED BY COLOR, SEX AND AGE PERIOD —DEATH-RATES PER HUNDRED THOUSAND, 1911-1916.

EXPERIENCE OF METROPOLITAN LIFE INSURANCE COMPANY—INDUSTRIAL DEPARTMENT.

Age period	Persons	White		Colored	
		Males	Females	Males	Females
All ages	4.3	1.6	3.9	6.4	20.7
1- 4	.4	.2	.5	2.3	1.5
5- 9	.3	..	.2	2.3	3.5
10-14	.6	.2	.5	2.7	3.4
15-19	.9	.3	.9	1.3	6.2
20-24	2.8	.3	2.5	2.3	19.8
25-34	5.5	1.4	4.8	4.6	24.5
35-44	8.9	2.9	8.4	8.8	31.1
45-54	9.2	4.1	8.1	15.3	30.9
55-64	13.0	10.9	10.1	19.2	39.2
65-74	11.9	10.3	8.8	21.7	41.1
75 and over	10.1	9.9	5.0	41.2	45.4

vanced ages. In any case it is significant that each of the color and sex groups, almost without exception, shows during the main period of life a higher incidence of pellagra as a cause of death for each advancing age period.

PELLAGRA MORE PREVALENT AMONG THE COLORED.

The colored race in the insurance experience shows uniformly a higher incidence of pellagra than does the white. This is true at every age period and for both sexes. In fact, the rate is four times as high for the colored males as for the white males, all ages combined, and more than five times as high for the colored females as for the white females. This condition is in large part the result of the different geographic distribution of the white and colored policyholders. The greater proportion of the colored policyholders reside in the southern states where pellagra is common, whereas the majority of the white policyholders reside in the northern states where pellagra is still a rarity. There is, nevertheless, a real excess in the mortality rate among the colored as is shown by the figures for a number of representative southern cities and towns where pellagra has been prevalent for a number of years. This we shall note later. (See Table V.)

PELLAGRA MORE PREVALENT AMONG FEMALES.

The rate for females is higher than for males both among the white and the colored. This is found at virtually every age period. The greatest difference is observed among the colored people where at each age period the rate for females is a number of times higher than the rate for males. It would be very interesting to learn why females in this country have approximately three times the pellagra mortality rate of males, since in a number of other countries where pellagra has been prevalent, no such relation between the sexes has been observed. In Italy, for example, the rate for 1913 was higher for males than for females. Roumanian and Egyptian statistics show no large excess of female pellagra deaths.

Insurance and Population Experience Compared.

It is desirable to compare the above findings for the policyholders of the Metropolitan with those for the population of the Registration Area of the United States.

TABLE II.

MORTALITY FROM PELLAGRA CLASSIFIED BY SEX AND AGE PERIOD—DEATH-RATES PER HUNDRED THOUSAND.

Experience of United States Registration Area, 1910–1915 and Metropolitan Life Insurance Company, Industrial Department, White Lives, 1911–1916, Compared.

Age period	Registration Area		Metropolitan	
	Males	Females	Males	Females
All ages	1.1	2.8	1.6	3.9
1– 4	.2	.3	.2	.5
5– 9	.3	.3	...	.2
10–14	.2	.4	.2	.5
15–19	.2	1.0	.3	.9
20–24	.5	2.4	.3	2.5
25–34	.9	3.7	1.4	4.8
35–44	1.4	5.2	2.9	8.4
45–54	2.3	4.9	4.1	8.1
55–64	3.8	5.4	10.9	10.1
65–74	3.8	4.9	10.3	8.8
75 and over	3.4	3.7	9.9	5.0

Table II presents the data for the Area for the six year period 1910 to 1915. This population experience contains but a small proportion of colored lives and the comparison may best be made with the experience for white lives in the Metropolitan. The rates for all ages combined are distinctly lower for both sexes in the population than in the white insurance experience. Considered by age periods, we find that under age 15 the rates are low and the differences between the two sets of figures are not so marked. After age 15 the population figures increase, but are considerably lower than those of the insured at virtually every age period for each of the two sexes. This condition is clearly explained by the fact that the Registration Area contains only a small section of the South where pellagra is prevalent whereas the Metropolitan experience covers a very considerable portion of this part of the country. A detailed examination of Table II nevertheless, presents some very interesting similarities in the two experiences. In the first place, with but few exceptions, females in both cases show higher rates than do males. Secondly, the rates increase with advancing age. In spite of their differences, therefore, the two sets of data confirm one another in a number of essential respects. If they do not correspond more closely in details it is because they refer to different geographical areas.

The above conclusion is confirmed by the similar distribution by age of the deaths from pellagra in the two experiences as shown in Table III.

The two distributions are remarkably

TABLE III.

DISTRIBUTION BY AGE OF DEATHS FROM PELLAGRA, 1911 TO 1915.

METROPOLITAN INDUSTRIAL EXPERIENCE AND REGISTRATION AREA COMPARED.

Age period	Metropolitan		Registration Area	
	Deaths	Per cent of total	Deaths	Per cent of total
All ages	1942	100.0	6694	100.0
1–14	74	3.8	264	3.9
15–19	52	2.7	193	2.9
20–24	136	7.0	491	7.3
25–34	394	20.3	1326	19.8
35–44	453	23.3	1565	23.4
45–54	355	18.3	1214	18.1
55–64	340	17.5	947	14.1
65–74	120	6.2	516	7.7
75 and over	18	.9	178	2.7

alike. It is only after age 55 that differences make themselves felt and these are the result in all probability of the very different age constitution of the living in the two groups; the proportion of policyholders after age 55 is very much lower than is the corresponding group in the population. For the main period of life, however, there is virtual correspondence, and we may conclude therefrom that the insurance experience for pellagra is representative of the condition prevailing in the general population. In no other way can we explain the close correspondence in the distribution of the deaths in the two series, having in mind that they are independently developed and cover different geographical areas. By considering the deaths alone in the two series we eliminate important sources of difference and are able to observe the essential similarity between the two groups. It is suggested that if the insurance experience coincided geographically with that of the population, the two sets of death rates would probably be in as close agreement as are the distributions of the deaths by age period.

INCREASE IN PELLAGRA IN RECENT YEARS.

It is only in recent years that pellagra has attained importance as a cause of death in the United States. Even as late as 1908 there were only 23 deaths from pellagra reported to the Census Bureau and all of these occurred in southern cities. Each succeeding year has shown, however, an increasing number of deaths. By 1910, pellagra had spread throughout the South and its appearance in many northern cities had become the subject of much comment in both the medical and the lay press. In 1911 the Census mortality report showed 654 pellagra deaths, an increase of 79 per cent over the number who died in the preceding year. In that same year, 277 deaths were registered in the Metropolitan experience alone. Table IV presents the experience of the Company and of the Registration Area, from year to year since 1911.

Because the Registration Area is a variable one it is believed that the mortality rate from pellagra among the industrial policyholders of the Metropolitan

TABLE IV.

MORTALITY FROM PELLAGRA, ALL AGES COMBINED, 1911 TO 1916—DEATH-RATES PER HUNDRED THOUSAND.

METROPOLITAN INDUSTRIAL EXPERIENCE AND REGISTRATION AREA COMPARED.

Year	Metropolitan		Registration Area	
	Deaths	Rate per 100,000	Deaths	Rate per 100,000
1911	277	3.6	654	1.1
1912	233	2.8	671	1.1
1913	290	3.3	1005	1.6
1914	492	5.3	1538	2.3
1915	650	6.7	2826	4.2
1916	368	3.6	2390	3.3

Life Insurance Company forms a better basis for noting the spread of this disease than do the population figures. This experience shows a decline in the year 1912 and a rapid and marked increase between the years 1912 and 1915 inclusive. In 1915 the total deaths reached 650 with a death-rate of 6.7 per hundred thousand exposed. It is of the greatest interest, therefore, to observe that in 1916 the number of deaths dropped to 368 and the death rate to 3.6, a decline in the rate of 43 per cent.

In general the picture presented by the Registration Area experience is similar. The year 1912 shows no change over the preceding year but thereafter there is, as in the insurance experience, an increase year by year including 1915 when the maximum rate of 4.2 was attained. The rate fell in 1916 to 3.3 per 100,000 living. Again we find a very marked parallelism in the tendency of the two sets of figures.

The reduction in the rate in 1916 is observed with but a few exceptions in every southern district where the Company operates. Table V presents the facts for a group of districts where the Company has a large number of persons insured and where pellagra has been a common cause of death in recent years. Both the white and the colored policyholders show a marked reduction in the rate for 1916. In some districts, no deaths from this cause were recorded in 1916.

Reports which have reached us from the health authorities of the southern states show, in general, an agreement with the insurance figures as to the trend of pellagra in recent years. Table VI presents the number of deaths and the death-rates for a number of southern states for the years 1914, 1915 and 1916. It is to be expected, therefore, that when the full mortality report of the Census Bureau for 1916 appears, the condition indicated by the Metropolitan's experience will be found to have prevailed throughout the population of the southern registration states.

TABLE V.

MORTALITY FROM PELLAGRA IN SELECTED SOUTHERN DISTRICTS, BY COLOR, 1916 AND 1915—DEATH-RATES PER HUNDRED THOUSAND.

EXPERIENCE OF METROPOLITAN LIFE INSURANCE COMPANY—INDUSTRIAL DEPARTMENT.

Area and district	1916		1915	
	White	Colored	White	Colored
Entire Metropolitan experience	2.2	14.2	4.0	22.8
Southern districts combined	44.7	82.1	86.3	121.0
Atlanta, Ga.	34.6	87.1	80.8	109.4
Augusta, Ga.	57.0	71.4	84.4	132.7
Columbus, Ga.	75.9	185.0	210.8	461.3
Macon, Ga.	54.2	68.0	90.8	77.0
Savannah, Ga.	*	45.1	78.4	94.2
Charlotte, N. C.	75.8	63.0	97.2	126.0
Greensboro, N. C.	20.6	65.9	59.7	124.3
Raleigh, N. C.	18.0	159.8	60.5	134.8
Columbia, S. C.	99.6	82.5	171.3	183.7
Spartanburg, S. C.	30.6	*	145.3	241.5
Chattanooga, Tenn.	40.1	33.2	68.5	116.4
Knoxville, Tenn.	67.3	60.2	94.4	74.1
Memphis, Tenn.	6.5	107.6	40.1	112.2
Nashville, Tenn.	46.1	49.7	38.7	47.6

(*) No deaths reported.

TABLE VI.

MORTALITY FROM PELLAGRA IN SELECTED SOUTHERN STATES, 1916, 1915 AND 1914—DEATHS, AND DEATH-RATES PER HUNDRED THOUSAND.

DATA FURNISHED BY STATE REGISTRARS.

State	Deaths			Death rate per 100,000 population		
	1916	1915	1914	1916	1915	1914
Kentucky	120	148	144	5.0	6.2	6.0
Mississippi	840	1535	1201	42.9	79.6	63.1
Virginia	249	332	250	11.3	15.3	11.6
Maryland	3	15	7	.2	1.1	.5
North Carolina	467	831	551*	19.4	35.0	23.6
Alabama	677	1109	819	29.0	48.2	36.1
Louisiana	295	301	...	16.1	16.7	....

* Low number probably due to fact that registration was not complete in 1914, having just begun in that year.

ON THE BACTERICIDAL EFFICIENCY OF SOAP SOLUTIONS IN POWER LAUNDRY.

H. G. Elledge
and
W. E. McBride.*

ONE of the first problems presented for study to the Industrial Fellowship on laundering, in operation in the Mellon Institute of Industrial Research, was the sanitary condition of the goods delivered from power laundries to their patrons. This problem has received intensive investigation by one of us (H. G. Elledge) during the past two years, and the practical observations and conclusions obtained thereby have recently been supplemented by the joint inquiry reported in this communication.

The views respecting this important subject which have appeared in the literature are illustrated by the statement of Wile† that, in the usual power laundry process, exposure to the heat and customary reagents, along with the mechanical agitation, destroys the hardiest of bacteria, and that "laundering as practiced in the better class of power laundries appears to be an efficient hygienic method of promoting cleanliness, without danger to patrons and with comparative safety for the employee."

In August, 1915, in order to confirm the conclusions given in and derived from the literature and to establish evidence which might be acceptable in court concerning a matter which, at that time, was of peculiar interest to the laundry industry, a number of tests were carried out in the senior author's laboratory. The results of this experimental work were presented to the Laundryowners' National Association in a special report and more briefly in a contribution to the technical press.*

A conclusion presented therein, namely, that the electric current, per se, has no germicidal value,† is of secondary interest here; but certain of the other findings are of importance in their relation to the subject discussed in this paper. Particular reference is had to the conclusion that the real sterilizing factors in the washing process are the heat of the various baths; the solutions of soap and weak alkalies, even at temperatures as low as 120° F.; hypochlorite solutions, when used; and the temperatures of the ironers, the dry-rooms, the hot-air tumblers, and the heated drying forms.

Subsequently to this, there appeared an article on "Laundries and the Public Health,"‡ conforming all of the con-

* The authors are indebted to Dr. A. B. Wallgren, of the Department of Biology of the University of Pittsburgh, for his courteous interest during the course of this investigation.

† *Medical News*, December 3, 1904.

* *Electrical Review and Western Electrician*, August 19, 1916.

† Confirmed by Chas. E. Marshall; see Marshall's "Microbiology," 166.

‡ "Laundries and the Public Health," by M. C. Schroeder and S. G. Southerland, *U. S. Public Health Report*, February 9, 1917.

clusions stated above in every particular, except those regarding the value of hypochlorite and soap solutions at low temperatures. The value attributed to hypochlorites by the authors of the paper mentioned is especially out of harmony with the evidence found so abundantly in the works of other investigators, and in the approved practice of sanitary engineers. Specifically, Lederer and Bachmann* found that the percentage reduction of various micro-organisms by 15 minutes contact with one part of available chlorine in 10,000,000 parts of water was 99.98 per cent, and with 5 parts of available chlorine in 10,000,000 parts of water, 100 per cent. For effective and comparatively harmless bleaching† in laundry practice, a concentration of available chlorine of one thousand times that mentioned above is required (viz., one part in ten thousand parts of water). The effectiveness of hypochlorite in treating municipal water supplies, as well as in medical practice,‡ is so firmly established that further investigation appears to be uncalled for. Another reason why it appears that the interests of the laundry patrons demand no further experimentation as to the value of this reagent is that all fabrics that may receive the bleaching treatment are ironed or dried at a high temperature and are, consequently, by any one or all of these means, completely sterilized.

The question of the bactericidal value of soap solutions at a temperature of about 120° F. is, however, of vital interest, because woolens and some fabrics of fugitive dyes should not be washed in baths exceeding this temperature and in many instances requires slow drying at room temperatures. Fortunately, woolen body garments are coming to be less commonly worn than in former times, but the washing of the vast number of blankets for hotel, Pullman and steamship service presents a sanitary problem, depending largely on the bactericidal value of soap.

The most notable investigation of the bactericidal value of soap solutions was conducted by Rodet,* who, after noting the conflicting reports on this question, explained that many of the discrepancies observed might be accounted for by variations in technic and in the statements of the actual concentrations of soap used. In the data which Rodet presents, he shows that strips of linen dipped in cultures of cholera, dysentery, and coli, and then coated with egg albumen, were sterilized at the end of one hour by being immersed in a solution of 4 per cent soap of Marseilles (probably a $2\frac{1}{2}$ per cent concentration of anhydrous soap) at a temperature of 45° C. Other bacteria proved to be more resistant, but Rodet noted that, in all cases, there was a decided attenuation and that concentrations as low as three parts per ten thousand inhibited the

* Lederer, A., and Bachmann, F., in a paper read before the Illinois Water Supply Association, *Engineering Record*, 65, 360–362 (1912).

† That is, compared to the effect of other parts of the washing process, such as mechanical wear, etc. See Elledge, "Conservation of Textiles in Laundering," *Scientific American Supplement*, July 14, 1917, 30.

‡ For instance, in the Carrel Treatment of wounds.

* A. Rodet, Professor of Microbiology, University of Montpelier, "Valuer antiseptique du Savon," *Revue de Hygiene, 1905*, 301.

growth of cultures in beef-broth. He concluded that soap solutions have a very real value as bactericidal agents.

In view of the facts presented above, the following experiments seemed desirable for definitely ascertaining the efficiency of soap solutions of concentrations practically employed in laundering woolens, together with the added effect of the agitation afforded by the power-driven washer. The tests as described below were carried out in a laboratory model of the usual type of commercial washers, under conditions obtaining in the washing of woolen garments in laundries.

Description of Experimental Work

In the first series of tests, the organism used was *B. subtilis* because of its high resistance to heat and germicides. It was thought that if it would be possible to kill *B. subtilis* with a reasonable exposure to soap solutions, then it would not be necessary to use other bacteria which might be found on soiled clothing, whose resistance is less than that of *B. subtilis*.

The first series of tests was carried out as follows:

Strips of cloth inoculated with large numbers of *B. subtilis* and similar sterile strips were placed in the washer with some woolen clothing. This batch was then rinsed with water having a temperature of 40° C., for five minutes. This water was drained off and replaced by clean water of 40° C. temperature. After introducing 200 grams of soap into the machine, the clothes were washed for 15 minutes, after which they were given three rinses with clean water at 40° C., to remove the soap. The number of bacteria was counted from samples of the tap water; the water in the washer at the end of the first rinse; the water at the end of the last rinse; and from infusions made from the inoculated and sterile strips in 300 cc. of sterile water after the strips had been dried in a centrifugal drier. The following tables give the results of the enumeration of three tests as above described:

Organism	B. subtilis	8 gal. water	Temp. 40° C.	200 grams of soap
No. in tap water	No. at end of first rinse	No. at end of last rinse	Infusion of inoculated strip	Uninoculated strip
30 per cc.	700 per cc.	175 per cc.	1,800	24
34	500	75	1,000	10
27	1,100	68	260	6

The results show that a considerable number of bacteria were not killed and remained in the cloth and also that the sterile strips became contaminated through the medium of the water. Small pieces of the uninoculated strips were taken after the infusion was made and plated in agar. After incubation, they developed six to fifteen colonies per square centimeter, showing that it would be impossible to remove all the bacteria from the clothing; hence a

reasonably accurate enumeration could not be obtained by this method.

The next experiments were carried out in a different manner. The usual amount of water at 40° C. was run into the machine. Then large numbers of *B. subtilis* were introduced into the water. After running the machine for 30 seconds to diffuse the organisms thoroughly, a sample of the water was taken to obtain the number of bacteria per cc. which was present. Then 200 grams of soap were put in, but no clothes were introduced into the machine. After a 20-minute run, a sample was again taken. An average of four such experiments gave a reduction of 56 per cent of the number of bacteria introduced. By the same method, it was found that, without using soap, a reduction of 41 per cent took place.

The same tests were also applied to *Micrococcus pyrogenes aureus* and *B. coli*. The samples were taken at 15 and 30 minutes. The following tables give the results obtained:

than a relative indication of the actual number of organisms present; that a count on the effluent from any washing bath does not give a true indication of the quantity of organisms remaining in the clothes being washed; and that plating a portion of the cloth in question in agar gives a more positive indication.

They also show that soap solutions at a temperature of 40° C. have a real bactericidal value.

Results with B. subtilis.—The churning of the water in the washing machine reduces *B. subtilis* 47 per cent without soap, and 64 per cent when subjected to the action of a soap solution of one part of anhydrous soap in 1,450 parts of water.

Results with Mic. p. aureus.—*Mic. p. aureus* was reduced 62.7 per cent in 15 minutes and 79.4 per cent in 30 minutes without soap; but when soap was used, the reduction amounted to 96.1 per cent after an exposure of 15 minutes, and 97.3 per cent after 30 minutes.

Organism Mic. p. aureus Soap 200 grams to 8 gal. water Temperature 40° C.

Start	15 minutes washing	% Reduction	30 minutes washing	% Reduction
9,000 per cc.	460 per cc.	94.9	330 per cc.	96.3
16,180	140	98.6	0	100.0
11,000	50	99.5	30	99.7
23,250	1,560	93.3	1,400	93.9
1,900	100	94.7	60	96.8
		Average 96.2		97.3

(Additional tables are on page 498.)

Conclusions.

The results of these experiments indicate that an infusion method for testing the bactericidal effect of any agent on an inoculated piece of cloth must not be considered to give more

Results with B. Coli.—The action on *B. Coli* was nearly the same. Without soap, there was a reduction of 59.5 per cent in 15 minutes and 76 per cent in 30 minutes. With soap (one part to 1,450 parts of water), the reduction

Organism Mic. p. aureus	No soap	8 gal. water	Temperature 40° C.	
Start	15 minutes washing	% Reduction	30 minutes washing	% Reduction
12,000 per cc.	7,120 per cc.	41	2,200 per cc.	81.6
23,250	9,900	57	4,600	80.2
15,260	5,200	66	3,000	80.3
22,300	6,000	70	42,000	81.1
		Average 58		80.8

Organism B. Coli	Soap 200 grams	8 gal. water	Temperature 40° C.	
Start	15 minutes washing	% Reduction	30 minutes washing	% Reduction
13,680 per cc.	510 per cc.	96.3	180 per cc.	98.7
15,000	560	96.3	220	98.6
27,000	1,300	95.2	900	96.7
		Average 95.9		98.0

Organism B. Coli	Soap 100 grams	8 gal. water	Temperature 40° C.	
Start	15 minutes washing	% Reduction	30 minutes washing	% Reduction
35,100 per cc.	6,500 per cc.	81.8 per	2,300 per cc.	93.4
17,500	3,300	81.2	2,350	86.6
5,870	1,250	78.8	940	84.
		Average 80.6		88.

Organism B. Coli	No soap	8 gal. water	Temperature 40° C.	
Start	15 minutes washing	% Reduction	30 minutes washing	% Reduction
15,260 per cc.	5,200 per cc.	65.9	3,000 per cc.	80.3
22,500	10,480	53	6,220	72.1
6,800	2,720	60	1,640	75.9
		Average 59.6		76.1

was 95.8 per cent in 15 minutes and 97.9 per cent in 30 minutes. When one part of soap to 2,900 parts of water was used, the reduction of the bacterial count was 78 per cent in 15 minutes and 87.8 per cent in 30 minutes.

Considering the omnipresence of organisms that, under certain conditions, may be considered pathogenic, it appears absurd to demand that a clothes-washing process should render fabrics absolutely sterile; but it has been demonstrated that such results are actually obtained in the case of all garments that are finished by ironing or drying at high temperatures, and that, in the case of those not so treated, the washing with soap produces a bactericidal efficiency comparable to that obtained by pasteurization.

THE EFFECT OF PLANKTON ANIMALS UPON BACTERIAL DEATH-RATES.

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and
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Sanitary Bacteriologist, U. S. P. H. S., Washington, D. C.

Read before the Laboratory Section, American Public Health Association, October 19, 1917, Washington, D. C.

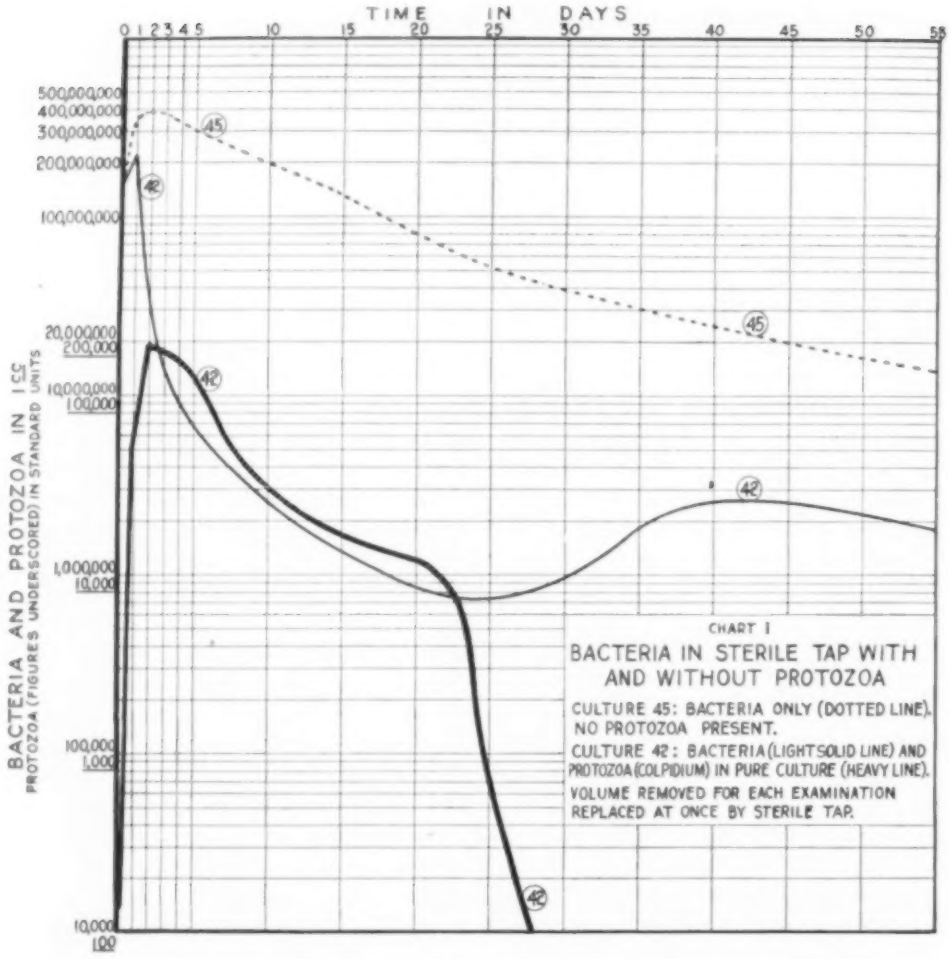
REPEATED observations by careful investigators seem to indicate that the rapidity of bacterial reduction in polluted water and sewage is not satisfactorily explained by the activity of the inhibitive agencies usually cited. Several eminent workers have frankly stated that an additional important agent of bacterial destruction is found in certain aquatic protozoa.

Comparatively recent studies establish the coincident presence of certain protozoa, with heavy pollution and high bacterial content, also the scarcity of these same protozoa when bacterial count is low. Whether these abundant protozoa are finding their chief food in the bacterial flora, or in the non-living suspended organic matter present, has apparently remained an unsettled question, although seemingly a matter of no small import in the study of Nature's methods of water purification.

It was, therefore, desirable to know (1) whether these protozoa will thrive if bacteria be absent, (2) whether bacterial history will be affected if no protozoa be present, and finally (3) whether, in a culture containing both protozoa and bacteria, either form of life will show any definite effects seemingly due to the presence and activity of the other form.

In accordance with these conditions cultures of sterile sewage were run, bacterial inoculation being by stock suspension of typical river and sewage forms, and, except as stated hereafter protozoa were used in pure culture. Cultures designated "Series 1" contained protozoa but no bacteria, "Series 2" contained bacteria but no protozoa, and "Series 3" contained both bacteria and protozoa. Information was thus sought as to the behavior of protozoa when bacteria are absent, the history of bacteria when protozoa are absent, and lastly bacterial history and coincident protozoan history when both are present in the same culture. All cultures, in 300 cc. flasks, were incubated in darkness at 20° C.

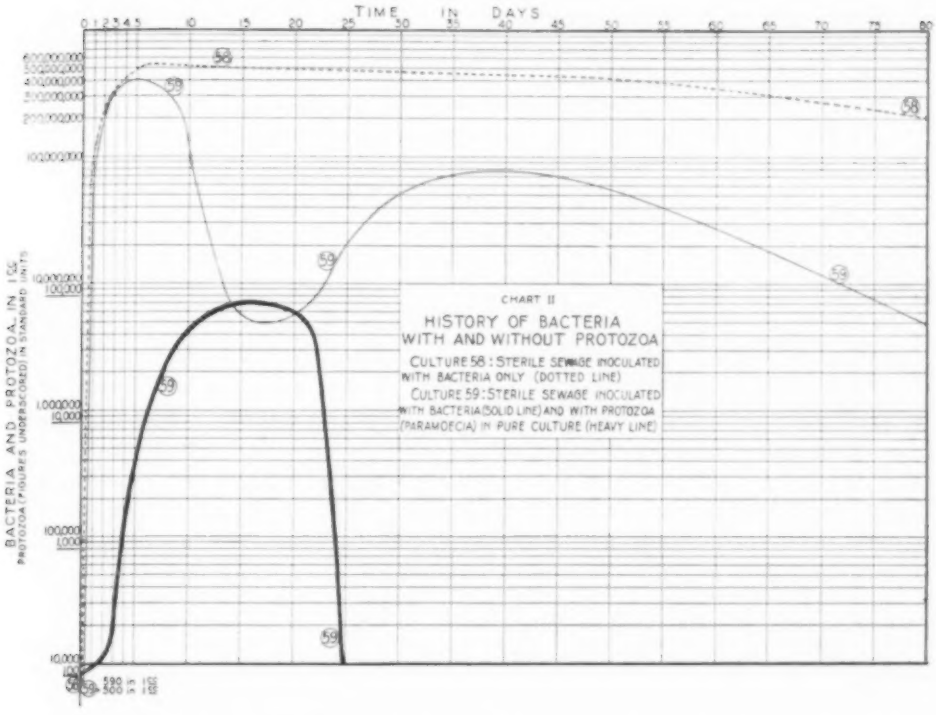
In Chart I, culture 45 (dotted line) is bacteria only. No protozoa are present. Maximum of nearly 400 million per cc. is reached in two days, followed by gradual decline until fifty-fifth day. In identical culture (42) differing only in that *Colpidium* (a minute ciliate) were added with the bacteria,—the bacterial count (light line) reaches a lower maximum of 200 million in one day, followed by very rapid decrease until the protozoa had practically disappeared, when there was a sudden increase of bacteria. In this same culture, the protozoa (heavy



line) meantime increase rapidly at the time of greatest bacterial reduction. It is to be noted that the bacteria are more reduced in this culture in five days than they are in fifty-five days in the companion culture (45) which contains no protozoa.

The curves here shown were affected somewhat by dilution caused in replacing, with sterile media, the amount removed at each examination. This was not done in subsequent cultures.

In Chart II, culture 58, containing bacteria only (dotted line), the count reached approximately 500 million in two days and maintained this high content for about thirty days, then decreased slowly. Control culture 59, identical except for the addition of 15 *Paramecia* to the 150 cc. of media used, showed similar bacterial history (light line) for five days, during which time the protozoa (heavy line) had increased remarkably. The bacterial

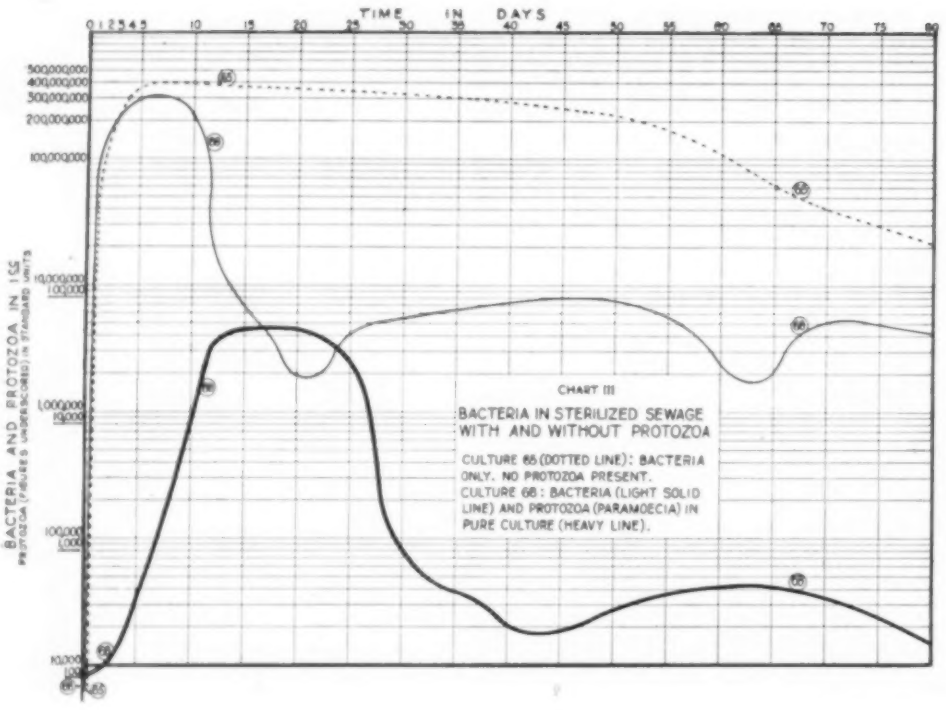

TIME IN DAYS
BACTERIA AND PROTOZOA IN 1 CC.
PROTOZOA (FIGURES UNDERSCORED) IN STANDARD UNITS
CHART II
HISTORY OF BACTERIA
WITH AND WITHOUT PROTOZOA
CULTURE 58: STERILE SEWAGE INOCULATED WITH BACTERIA ONLY (DOTTED LINE)
CULTURE 59: STERILE SEWAGE INOCULATED WITH BACTERIA (SOLID LINE) AND WITH PROTOZOA (PARAMOECIA) IN PURE CULTURE (HEAVY LINE)

count now broke abruptly and decreased until the protozoa had diminished to small numbers, whereupon the bacteria developed a secondary rise.

Chart III shows results apparently practically identical with the foregoing,—but with this difference, viz., bacterial content shows a small secondary rise, and after fifty-five days a third increase develops. Meantime the protozoa (heavy line) did not die out, though reduced to small numbers. It is to be noted that the protozoa show a secondary rise coincident with the secondary reduction in bacterial content.

Unusual interest attaches to the behavior of protozoa (Paramœcia) in a culture entirely free from bacteria. This unusual environment for this typical sewage organism was secured, after many failures, by obliging the Paramœcia to swim through a *Marathon bath* of nearly thirty feet of sterile water. Subsequent handling was done with elaborate precautions to prevent contamination. Two flasks of sterile sewage were inoculated with 12 Paramœcia each. Two check cultures of sterile sewage were inoculated with 3 Paramœcia each, but to these latter cultures heavy bacterial inoculation was added as food for the Paramœcia. Results were as follows:

After 6 days one flask showed bacteria in large numbers. Paramœcia in this same culture increased nearly 100-fold in 14 days. The second flask gave


TIME IN DAYS
BACTERIA AND PROTOZOA IN 1 CC.
CHART III
BACTERIA IN STERILIZED SEWAGE WITH AND WITHOUT PROTOZOA
CULTURE 65 (DOTTED LINE): BACTERIA ONLY. NO PROTOZOA PRESENT.
CULTURE 68: BACTERIA (LIGHT SOLID LINE) AND PROTOZOA (PARAMOECIA) IN PURE CULTURE (HEAVY LINE).

sterile plates at 6 days, 8 days, and 14 days, but Paramœcia all died before the 4th day. Both check cultures, containing large numbers of bacteria, showed heavy increase in Paramœcia.

It was thought possible that death of protozoa in the sterile culture might be due to some unfavorable condition of the media (sewage) developed, perhaps, in the process of sterilization in autoclav. Accordingly after 14 days' sterility this identical media was reinoculated with 12 Paramœcia from the same stock culture which had supplied the first ones, the only difference being that these last ones were not elaborately cleansed by "Marathon bath." With this second protozoan inoculation, however, there was added a heavy inoculation of bacterial suspension. These results were noted:

Bacteria increased from initial content of less than 2 millions to over 16 millions in 48 hours, then fell to 8 millions in 96 hours with further decrease to 270,000 per cc. on 30th day. Meantime Paramœcia with initial content of 1 in 10 cc. increased to 3 per cc. in 48 hours, to 43 per cc. in 96 hours reached maximum of 334 per cc. in 8 days with subsequent slow decrease to 27 cc. in 30 days.

These results seem to indicate (1) that it is possible to free Paramœcia from all bacteria; (2) that these Paramœcia are unable to live in sterile sewage, though non-living suspended organic matter is abundant; (3) that

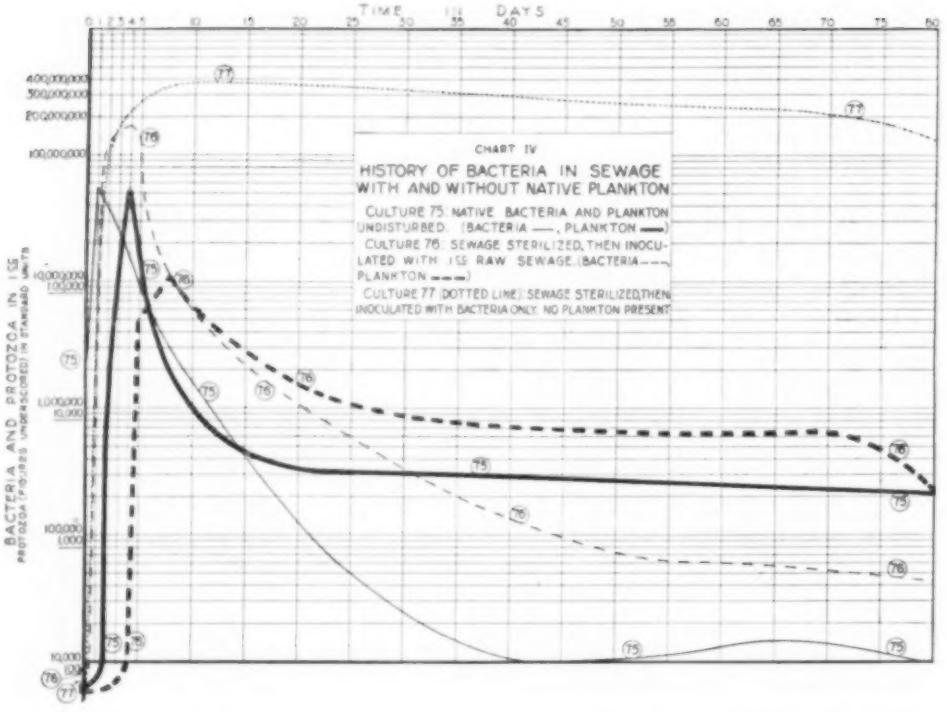
other Paramœcia, which have had identical treatment live and multiply in an identical culture which, however, becomes contaminated and develops high bacterial content; (4) that in check cultures, Paramœcia which have received identical treatment live and multiply enormously if heavy bacterial inoculation be added at the start; (5) that the identical culture medium in which Paramœcium could not survive when bacteria were absent, becomes favorable to growth and increase of Paramœcia *when bacteria are added;* (6) that the death of Paramœcia in sterile flask could not have been due to want of non-living suspended organic matter, for this was present; nor to injury resulting from the long "Marathon bath," for other Paramœcia subjected to this same treatment lived and multiplied in the other flask and in check cultures. Nor was death caused by unfavorable condition of sterilized media, for this identical media inoculated later with bacterial suspension enabled Paramœcia then introduced to live and multiply.

All preceding experiments were conducted with protozoa in pure culture, whereas under conditions as they exist in Nature a variety of animal forms, and sometimes of plant forms also, constitutes the native plankton. Such complexity of forms, and the varied activities and results produced thereby, might produce an aggregate effect on the bacterial content very different from the effects already recorded in cultures whose protozoa were limited to one kind only.

Information on this matter was furnished by cultures of sewage whose histories are shown in Chart IV.

In culture 77 (which contained no protozoa) bacteria repeat the history of similar cultures in previous experiments, reaching high maximum in the first few days and maintaining it for several weeks. In culture 76 (inoculated with 0.1 cc. raw sewage) similar initial bacterial content rises at same rate, but is arrested on reaching moderate maximum on 4th day and there follows a sudden decrease which continues less rapidly up to the 80th day. The only known difference between these cultures lies in the fact that while 77 contained bacteria only, 76 contained minute protozoa together with bacteria, both introduced by the 0.1 cc. raw sewage added. Greatest increase of protozoa in this culture was coincident with greatest bacterial reduction. It seems evident (a) that bacteria in culture 76 do not decrease as a result of their own growth, for the higher numbers in culture 77 do not thus decrease. Also (b) the long-sustained high bacterial content of 77 is not because of a better medium being produced by sterilizing the sewage: the sewage in culture 76 is also sterilized, but the addition of only 1 part of raw sewage in 1,500 of sterile serves to bring about the bacterial decrease in this culture.

In the untreated culture 75, which contained all its native plankton and bacteria, the latter reached low maximum in 1 day, broke sharply and decreased rapidly, then more slowly, until the count was very low. (This agrees with the history of a large number of similar stored sewage samples


TIME IN DAYS
CHART IV
HISTORY OF BACTERIA IN SEWAGE WITH AND WITHOUT NATIVE PLANKTON
CULTURE 75: NATIVE BACTERIA AND PLANKTON UNDISTURBED. (BACTERIA ——, PLANKTON ——)
CULTURE 76: SEWAGE STERILIZED, THEN INOCULATED WITH 1SS RAW SEWAGE. (BACTERIA – – –, PLANKTON – – –)
CULTURE 77 (DOTTED LINE): SEWAGE STERILIZED, THEN INOCULATED WITH BACTERIA ONLY. NO PLANKTON PRESENT.
BACTERIA AND PROTOZOA IN 1SS
PROTOZOA FIGURES UNDERSCORED IN STANDARD UNITS

examined at this laboratory.) Meantime the plankton increased to high maximum in 4 days, then broke sharply and decreased rapidly, then slowly.

Thus the two plankton-containing cultures, 75 and 76, show essentially similar bacterial history. Similar agreement is evident in plankton history also. It is to be noted that in neither case does plankton die out, as frequently happened when pure cultures of protozoa were used.

The greater anti-bacterial efficiency is shown by culture 75, which contains all its native plankton and bacteria. Increase of bacteria if checked in 1 day, the numbers rapidly decreased and finally reduced to 10,000 per cc., while in culture 76 (containing very minute plankton only, and in limited variety) bacterial increase continues unchecked until the 4th day, and is finally reduced no lower than 50,000 per cc. This seems to indicate that the anti-bacterial factor requires a time period to become effective which in general coincides with the time required for the plankton, introduced in very small amount, to increase to relatively large content.

In both cultures containing plankton there was distinct and permanent improvement in turbidity and odor in less than 10 days. In culture containing bacteria only, these physical conditions remained practically unchanged for 70 days.

This experiment as a whole tends to show that the varied living forms which constitute the native plankton of sewage collectively exercise the same anti-bacterial influence that is displayed by a pure culture of protozoa. It also seems evident that this influence is most efficient when all the natural plankton is present, as bacteria are then reduced to very low content. It thus seems that Nature's methods excel laboratory procedure.

All results of experiments as recorded tend, on the whole, to establish certain facts as follows:

(1) A sewage culture containing no protozoa, but containing bacteria only, shows high bacterial content attained in 2 to 6 days and maintained without material reduction for 6 to 15 weeks.

(2) A sewage culture containing *no bacteria*, but protozoa (Paramœcia) only, remains bacteria-free indefinitely but these protozoa die in a very few days.

(Owing to the great difficulty of eliminating *all* bacteria from the living Paramœcia—here accomplished for the first time, so far as known to the writers—only one culture was entirely successful.)

(3) A culture containing both bacteria and certain protozoa shows high bacterial maximum speedily and heavily reduced, with rapid increase in protozoa at time of greatest bacterial decrease. An apparently reciprocal but essentially direct relation seems to exist: The protozoan curve follows the bacterial, reproducing 2 to 6 days later the broad curves described by bacterial history. If protozoa die out, bacteria show a secondary rise.

(4) Untreated sewage containing all its native plankton and bacteria reaches medium bacterial maximum in 1 day, then a sudden decrease followed by gradual reduction to low values. Plankton meantime reaches high maximum in 3 or 4 days, breaks sharply and later decreases gradually following in general the bacterial curve.

(5) Certain protozoa that are usually abundant in sewage-polluted water are able to live and multiply enormously when no food except bacteria is available.

This proposition of fundamental importance is supported by the surprising multiplication of *Colpidium* in 12 cultures of sterile tap-water inoculated with bacteria from agar plates. (See Chart I.) Many additional cultures give evidence relative to the same fact.

It thus seems evident that the anti-bacterial influence exerted by certain protozoa is due to a food relation, and that these animals of the plankton therefore consume bacteria in large numbers. These protozoa are practically always present in sewage or water having high bacterial content; hence their food habits as suggested by environment, as suspected by many workers and observed by some, and as substantially confirmed by the definite records herewith submitted, will constitute a factor to be reckoned with in the biological disposal of sewage and purification of polluted water.

REPORT OF THE COMMITTEE ON STANDARD METHODS OF EXAMINING DISINFECTANTS.*

SECTION A. INTRODUCTION.

IN 1912 the Laboratory Section, A. P. H. A., adopted as the official standard method for the examination of disinfectants the procedure devised by Anderson and McClintick† with certain modifications relating chiefly to the phenol and the culture media. The committee report stated at that time:

"Since the publication of Bulletin No. 82 comparisons of the results of tests made by different members of the Committee upon duplicate samples have led to the belief that further studies may develop points of value in the further elaboration of the method which will tend to produce greater uniformity of results in the hands of different workers."

During the past two years the Committee on Standard Methods of Examining Disinfectants has been engaged upon such further studies looking toward the improvement of certain recognized defects in the present standard method.

Of the present membership only three have been in a position to do actual laboratory work. The Committee has been fortunate, therefore, in having secured the collaboration of Dr. Wilhelm Dreyfus, of the Chemical Department of the West Disinfecting Company, of Dr. E. M. Houghton, of the Park, Davis Research Laboratories, and of Mr. J. M. Weiss of the Research Department of the Barrett Manufacturing Company. It was therefore possible to arrange for the participation of the following laboratories in the comparative tests:—the Hygienic Laboratory of the U. S. Public Health Service, the laboratory of the Bureau of Animal Industry on behalf of the Federal Insecticide Board, the Lederle Laboratories on behalf of the West Disinfecting Company, and the Laboratories of Parke, Davis & Company, and of the Barrett Manufacturing Company. Mr. J. H. Wright of the Lederle Laboratories has been in part responsible for that Laboratory's contribution and has in addition made the special studies of the effect of acidity in media.

Investigations by the Committee.

Early in 1915 a comparative test was arranged whereby each of the five laboratories undertook to test two special disinfectants by both the R-W and the H-L procedures and by two techniques under each procedure, making eight tests in all. Each test was done in triplicate to obtain data upon the reliability of the various procedures. The first technique employed the ordinary phenol and organism used in the laboratory, the second, a special typhoid culture and synthetic phenol sent out by the Committee. The 120 results were submitted to a careful analysis and comparison. The following conclusions were drawn:

1. Under all procedures the agreement between the three check determinations was as close as the nature of the test permits *i. e.* within one dilution or one time interval.

2. In all cases the phenol values used in dividing were in equally good agreement as between the various procedures in the same laboratory, showing that no great part of the variation is attributable to variations in phenol or in organism.

* This report was presented before the Laboratory Section, Oct. 20, 1917, and was accepted and ordered published, in order that it might come up for final adoption at the next meeting. Pending such final adoption it is not official.

† Anderson and McClintick, Hyg. Lab. Bull. No. 82, 1912.

3. Each laboratory showed a distinct "laboratory variation" whereby it tended to be uniformly higher or lower than the average of all five.

4. As between laboratories, the average deviation from the mean was, with one disinfectant (coefficient about 5), 10 per cent for the H-L method and 18 per cent for the R-W; with the second disinfectant (coefficient about 15), 6.5 per cent for the H-L and 14 per cent for the R-W; or approximately twice as great a discrepancy between the five laboratories when using the R-W method as when using the H-L (three of the laboratories regularly used the R-W method and four of them, the H-L).

5. The H-L method was, in the final average, 5 per cent higher than the R-W, on the one disinfectant and 11 per cent lower on the other.

In view of the showing of the work of these five laboratories, all skilled in disinfectant testing, it was concluded that some further changes were necessary in the technique in order to render it available for general use. Evidence had accumulated in the meantime that the media employed in the standard procedure were too acid for satisfactory results. Reports were received of difficulty of obtaining good growths in the broth and hydrogen ion determinations indicated excessive and variable acidity.

At this point Mr. Wright undertook a special study of this phase of the problem the results of which have already appeared in print.* He was able to demonstrate a definite dependence of the observed phenol coefficient upon the degree of acidity of the broth employed and also the advantage, in uniformity of results, of broth approximately neutral in true reaction. He also considered the suitability of certain American brands of peptone.

* Wright, J. H. Jour. of Bacteriology Vol. 2, No. 4, 1917.

During 1916 a second extensive comparative test was planned and carried out by the same group of laboratories, the collaborating laboratories representing at this time, however, the Association of Disinfectant Manufacturers. The broth used was unadjusted and practically neutral, and some minor modifications were introduced in the method of preparing the typhoid culture. The results of this test were much more satisfactory. The average deviation from the mean for all H-L tests was 6.75 per cent and for all R-W tests 4.6 per cent. The work in this case was divided so that three laboratories worked with each test. With the range of phenol dilutions employed the successive dilutions vary by about 10 per cent which fixes the lower limit of error of single test. Three laboratories making three tests each should report an average deviation of about 3.3 per cent if all other sources of error are eliminated. It is probable, therefore, that the technique devised is free from sources of gross error and that no further refinement of technique will permit much greater accuracy than that reported. It is also worthy of comment that with the same media the two major methods are of approximately equal accuracy and furthermore that they yield results that are quite concurrent. For the whole series the H-L results are 1.5 per cent higher than the R-W, a figure well within the range of error between the laboratories and therefore without significance.

The study included also a comparison of Witte's and Armour's peptones and indicates a uniformly higher result with the former averaging about 7 per cent.

The recommended technique is based upon the results of these investigations.

The most important change that has been recommended is in the media employed. Our investigations in this direction have been referred to. The acidity of the media recommended by Anderson

and McClintick is not only too high for satisfactory growth of the test organism, but is also extremely variable, not only among the several laboratories, but from time to time in the same laboratory. By the application of the newer views of acidity, as set forth by Clark and Lubs,* it has been found that media made without any attempt at adjustment are not only more suitable for the growth of the organism but are far more uniform and reliable.

The hydrogen ion concentration of the culture media is of the utmost importance and it is recommended that each batch of medium be tested for hydrogen ion by the colorimetric method described by Clark and Lubs.

It has been found that the hydrogen ion concentration most conducive to uniform results is approximately $P_H = 6.5$.† However, any medium made according to the formula recommended may be used provided the P_H value does not vary more than one-half unit from this figure. Several brands of peptone were studied in detail and of these, two, Witte's and Armour's, were tried in the comparative work done in the five laboratories.

It is recommended that Witte's peptone be used for all important work. The Committee's experience shows, however, that Armour's peptone gives results closely approximating those obtained by Witte's although somewhat lower, so that this product may be used for routine control purpose. It should not, however, be employed unless the hydrogen ion concentration of the finished medium falls between $P_H = 6$ and $P_H = 7$. Care should also be exercised in interpreting the results obtained with this peptone and too much reliance should not be placed upon such results unless the particular lot of peptone in question has been thoroughly tested and found to be in every respect comparable with Witte's peptone. So far as the work of the Committee has gone, no other brand of peptone may at present be substituted for Witte's. Several manufacturers, however, have recently made changes in their processes of manufacture. In every case the newer products have, with the small number of samples tested, given quite satisfactory results so that it is probable that other products may, upon further investigation, prove available. Some variation has been found in the meat extract, especially in the matter of acidity but there appears to be no satisfactory way of standardizing this product. The Committee wishes to point out the need for further studies upon peptones and meat extract and to invite the coöperation of other bacteriologists in the work.

It has been suggested as a possible solution of the difficulty of variable media that a stock of one or two disinfectants be carried at some central laboratory, such as the Hygienic Laboratory of the U. S. Public Health Service at Washington, and that specimens of these be submitted upon request with a full determination of the constants under the approved standard procedure. Such standard specimens would serve as a basis for the standardization of the technique and media of the individual laboratory, including also the strain of organism and the particular sample of phenol used. Such a program would involve among other things consideration of the permanence of the standard disinfectants selected. A still more desirable procedure would be the complete determination of the biological constants of another standard substance, capable of being prepared and kept in pure and permanent form and having a coefficient of from 3 to 5, and a concentration exponent other than 6. With such a second known

* Jour. of Bact. II, 1917, pp. 1, 109, 191.

† The symbol, P_H, stands for the log. of the reciprocal of the hydrogen ion concentration, in terms of normal.

standard available it would be possible for any laboratory to control its entire technique including all variables in organism or the composition of media. It would then be possible to make such minor changes as the substitution of another brand of peptone or extract in the media with assurance that the results would not be modified. A full investigation of this matter is now under way.

The studies of the Committee have indicated that slightly lower phenol coefficients are obtained with the new media than with the old. A change of this sort, while, in one sense, perfectly fair to all manufacturers, would be distinctly troublesome if it necessitated a change of labels and difficult explanations to customers. The slightly increased average time of testing has, therefore, been adopted not only to offset this reduction in coefficient, but also to give proper range to the time factor determination. By reasons of its great relative inaccuracy the 2.5 minutes test has been abandoned, and in order to economize both labor and materials, only those tests are completed which are required in the final computations.

Some studies of the constancy and reproducibility of the platinum loop have shown what has always been more or less obvious that as an instrument of even approximate accuracy, the loop is seriously deficient.

The new loop which is recommended was suggested to us by Dr. Arthur G. Stimson, Assistant Director of the Hygienic Laboratory, Washington, and has been carefully tested as to its reproducibility and its constancy. Comparative tests have been made also with the present standard loop. A strong solution of methylene blue in standard broth was substituted for the bacterial culture, "inoculations" being made into small tubes containing 7 cc. of distilled water. The resulting colors were read against a set of standards. In this way the amount of solution removed by each inoculation was readily determined. Ten loops were prepared and tested, the mean volume taken up by each one being determined by the average of ten "inoculations." The variation among these ten averages is taken as a measure of the reproducibility of the loop, *i. e.*, the agreement between the average performance of various loops. Six standard platinum loops were compared in the same way.

The volumes (average of ten readings each) actually taken up by the ten new loops were, in arbitrary units, 4.90; 4.94; 4.95; 4.98; 4.99; 5.01; 5.06; 5.08; 5.28; average 5.03, mean deviation .077 or 1.53 per cent. It is apparent that most of this error is due to one loop, omitting which, the results of nine tests would be, average 5.0, mean deviation .05 or 1.0 per cent. For the six standard platinum loops the volumes taken up were (average of ten trials each) in the same arbitrary units, 3.83; 3.89; 4.12; 4.15; 4.26; 4.46; average 4.12, mean deviation 0.17 or 4.10 per cent.

The mean error of the individual dip as compared with the average of ten dips with the same loop, measures the constancy of the loop. For the one hundred trials made with the ten new loops this mean deviation was found to be 2.52 per cent and for sixty trials with the six standard loops, 9.28 per cent.

The two kinds of error may be combined to give a general measure of error of each type of loop by counting the mean deviation of all the readings of all the loops of each type from their general average. This procedure gives for the ten new loops, average volume of one hundred trials, 5.03; mean deviation 0.136 or 2.71 per cent, and for the six standard loops, average volume 4.12; mean deviation 0.413 or 10.0 per cent.

The new loop is approximately equal to the present standard loop in volume, the average volume of the ten new loops

being 5.03 arbitrary units and the corresponding volume of the standard loop, 4.12.

A modified system of dilutions is recommended which is both simpler and more consistent than the older one. In the selection of a proper range of dilutions attention must be given to the accuracy required and possible. As the coefficient is a ratio the accuracy is also relative, that is, a certain percentage of the final results. An ideal dilution schedule would, therefore, proceed as a geometrical progression, each successive dilution being a constant multiple of the preceding one. The practical difficulties of such a scheme are greater than its advantages would justify so that the expedient has been adopted of dividing the whole range into groups, the mean terms of each group being in geometrical progression, and the members of each group in arithmetical series, that is advancing by equal increments. This increment is 10 per cent of the number occupying the position of geometrical mean of each group, and 7 per cent. and 12.5 per cent respectively, of the end numbers of the group. This arrangement simplifies the making of dilutions since the whole spacing of the system is uniform, each group being similarly related to its basic dilution.

SECTION B. STANDARD PROCEDURE.

The following systematic procedure, taken in part from the progress report of the Committee for 1911, is set forth especially as an aid to beginners, and to illustrate the fact that certain details are subject to considerable variation without affecting the important features which make for uniformity of results.

Apparatus.

Sub-culture Tubes. A test tube rack of eight rows of ten holes each may be used for the sub-cultures. If the test be of twenty dilutions, eighty tubes are numbered serially and placed in the rack, which is placed conveniently at the worker's left hand.

Bunsen Burner. A bunsen burner, with a fan-tail top is led from the left and back of the bench with a little spare tubing.

Loop-rack. This is made of four pieces of half-inch wood, each 4 inches by 9 inches, joined in a frame so that the top is about 10 inches high. The top is provided with about six grooves for the loops. The latter are placed in their grooves and the rack is placed in front of the worker's right shoulder, close to the front of the bench, and almost at right angles to the front edge, but with a slight slant to the right and rear. The loops point to the left and the fan-tail burner is so adjusted as to properly envelop the loop which is

Fig. 1—New Standard Loop.

Four turns of Nichrome Wire, No. 23, B. & S., about a core, 0.072 inch in diameter (No. 13, B. & S.)

over it. The loops are used in succession and after each one is returned to its place, the burner is moved under it, thus providing at all times for a sterile and cool loop.

Loops. The loops used for transferring the culture after exposure to the disinfectant are made as follows:

A close cylindrical spiral is made by winding Nichrome wire, No. 23 B. & S.,* as tightly as possible about a piece of steel or other hard wire having a diameter of .072 inch (No. 13 B. & S. gauge). Wind about five full turns, bend the remainder of the wire sharply at a right angle to the wound portion, and parallel to the axis of the cylinder. Remove from the core and cut off the lower end to leave exactly four complete turns. When completed the successive turns of the spiral must touch one another continuously. See Fig. 1.

Seeding Tubes. The character of the seeding tubes to be used depends entirely upon local conditions. In places in which there is any doubt as to air contamination cotton-plugged tubes are much to be preferred. However under conditions such as exist in most laboratories the open seeding tubes, recommended in the present standard methods, are most convenient and quite satisfactory.

Seeding Tube Holder. Cut down an oblong wire test-tube basket to about 2½ inches in depth, and to the top fit a piece of half-inch wood, through which three rows of seven holes each have been bored, the holes being of proper size to accommodate the tubes loosely. An ordinary tripod is used to support this rack in the water bath. The legs of the tripod are cut so that the tops of the seeding tubes are a little above the surface of the water.

Inoculator. The inoculations of the diluted disinfectant with the culture are made with an apparatus described by Rosenau.* A capillary pipette, graduated in tenths cc. is fitted with a rubber bulb, and clamped to a ring-stand. The bulb is actuated by a second spring clamp the jaws of which engage it. This apparatus is placed at the right of the worker, so that he can push the loop rack away from him and draw the inoculator toward him and when through inoculating, reverse the action.

Water Bath. The water bath consists of a wooden box about 18 inches square and deep, containing a three or four gallon pail, packed around with sawdust which is lightly oiled so as not to become dusty. The bath is raised from the floor about six inches by cleats and castors, and when not in use is rolled under the bench. During the test it is on the floor at the right of the worker.

Time-piece. A watch or small clock of fair accuracy, provided with a second hand, is so mounted as to be conveniently and comfortably read by the worker from his place at the bench.

Culture Media.

The culture media are prepared as follows:

Broth. 10 grams of peptone (Witte's); 3 grams of extract of meat (Liebig's); 5 grams of sodium chloride, C.P.; Distilled water, 1,000 cc.

Boil for 15 minutes, make up to weight, filter, tube, sterilize at 10 pounds pressure for 20 minutes. No adjustment of the acidity whatever should be attempted. Determine and record the P_H value. This should be between 6 and 7.

Agar. To 1,000 cc. of the standard broth add 15 gms. of best grade agar, boil 30 minutes, make up to weight, filter, and sterilize at 10 pounds for 20 minutes. Do not use egg albumen to clarify.

* Manufactured by Driver Harris & Co., Harrison, N. J.

* Hyg. Lab. Bull. 21, p. 60.

Organism.

For the standard test organism in determining the coefficient against the typhoid organism a 24 hour old broth culture of B. typhosus (Hopkins) is used. Before beginning a test the culture is carried over in broth at 37° every 24 hours for at least five successive days, and the last culture well shaken, and filtered through sterile filter paper.

For carrying over the culture one standard loopful is used. It is important that the transfers be made as nearly as possible exactly on the 24 hour interval, although a variation of not more than 2 hours is allowable.

The stock culture of B. typhosus (Hopkins) is kept on agar slants. These cultures are incubated at 37° C. for 24 hours and then placed in the refrigerator until ready for use. In no case, however, should they be kept more than one month.

Phenol.

While pure phenol crystals are undoubtedly the best standard which we have at present, they are far from being entirely satisfactory. Commercial phenol crystals are often contaminated with cresols and other phenol homologues. It is important that nothing but the highest grade of pure white synthetic phenol crystals be used,* of a solidifying point not less than 40° C. as determined by the method of Weiss and Downs.†

Phenol crystals themselves, as well as solutions change in germicidal strength upon standing, particularly when exposed to direct sunlight and to high temperature. Phenol changes more readily when melted, or in the presence of moisture, than when in the crystalline form. It is important, therefore, that the crystals of phenol be kept in a tightly stoppered bottle, in a cool, dry place and exposed to the light and moisture as little as possible. Phenol which has been exposed to the air and allowed to absorb enough water to alter its melting point or which has become at all red should be discarded for the purposes of this test. The 5 per cent stock solution is prepared as follows:

Melt the phenol in the original container and pour out approximately 50 grams into a closed weighing bottle; weigh and dissolve in the proper amount of water to give a 5 per cent solution. Do not attempt any further standardization. This stock solution is kept in the refrigerator in amber colored bottles of not more than 500 cc. capacity, and for a period not longer than three months.

Dilutions.

Distilled water. Sterile distilled water is recommended for all dilutions. Attention is directed to the danger of metallic copper in distilled water prepared with the common type of laboratory still in which the condensing surface is of tin-plated copper or brass. If the tin-plate is worn away, sufficient copper may be dissolved to materially influence the coefficient.

Five Per Cent Stock Dilution. Accurately graduated capacity pipettes are to be used in preparing the stock dilution of disinfectant. Five cc. of disinfectant are measured into a flask containing 95 cc. of sterile, distilled water, the interior of the pipette being rinsed several times with the contents of the flask. From this solution or emulsion and from the stock 5 per cent phenol solution the required dilutions are prepared.

Initial Dilution from Five Per Cent Dilution. Take 50 cc. of the 5 per cent stock dilution, place in a 100 cc. graduated flask and make up to the mark with sterile distilled water. Mix by pouring.

This gives a dilution of 1:40. With 50

* The Barrett Manufacturing Company can furnish such a product.

† Jour. of Industrial Chemistry, Vol. 9, No. 6, page 569

Initial dilution + water (cc.)	Initial dilution					
	1:20	1:40	1:80	1:160	1:320	1:640
	Final dilution					
4+4	1:40	1:80	1:160	1:320	1:640	1:1280
4+5	1:45	1:90	1:180	1:360	1:720	1:1440
4+6	1:50	1:100	1:200	1:400	1:800	1:1600
4+7	1:55	1:110	1:220	1:440	1:880	1:1760
4+8	1:60	1:120	1:240	1:480	1:960	1:1920
4+9	1:65	1:130	1:260	1:520	1:1040	1:2080
4+10	1:70	1:140	1:280	1:560	1:1120	1:2240

cc. of this dilution repeat the process to obtain a dilution of 1:80 and so on by successive dilutions until the following initial dilutions, or such of these as are necessary for the test, are prepared:

1:20	1:160
1:40	1:320
1:80	1:640

Final Dilutions from Initial Dilutions. With sterile delivery pipettes measure the quantities of initial dilutions and sterile distilled water, required, in accordance with the following table, to obtain the desired final dilutions.

Temperature.

The standard temperature at which the organism is exposed to the action of the disinfectant is 20° C. but a variation of not more than 0.5° on either side of this figure is allowable. This temperature should be maintained by the use of a water bath, the design of which may be left to the individual operator. It is important, however, that the bath be so arranged that the water will rise to a height greater than that of the dilution of disinfectant contained in the seeding tubes. The cultures and dilutions of disinfectant should be brought to a temperature of 20° C. before starting a test. In very warm weather it will be found that there is a material increase in the temperature of the water bath during the 20 minute period. If, however, the bath is brought at the start to a temperature of 19.5° it will not generally exceed 20.5° during the test. For the determination of the temperature coefficient a temperature of 30° is also employed.

All sub-cultures are incubated at 37° for 48 hours. The temperature of the incubator should be maintained between 36° and 38°.

Technique.

The various dilutions are prepared as already described.

In the test of a new preparation the coefficient of which is unknown it will be necessary to make a set of range-finding tests. For this purpose use the series 1:40, 1:80, etc., at the head of the columns in the Table of Final Dilutions and select for the actual test with phenol a series of final dilutions ranging from the highest dilution which killed in 5 minutes, to the lowest dilution which failed to kill in 20 minutes. If some approximate idea of the coefficient is available, or if the preliminary test indicates a too extensive range of dilutions for the final test, a closer range may be obtained by restricting the test to fewer columns and using the middle row of dilutions together with the top row.

The seeding tubes having been properly

sterilized are brought to the bench and placed in the seeding tube rack to the number required. Five cc. of each of the dilutions of phenol and of the disinfectant to be tested are placed in order in these seeding tubes, which are appropriately numbered, a separate 5 cc. delivery pipette being used for each dilution. The tube containing the filtered culture is next placed in one of the holes of the seeding tube holder which is then placed in the water bath and allowed to stand there for a sufficient time to bring the contents to temperature. The inoculator is then filled with culture and, at the beginning of an even five-minute period, the first seeding tube is inoculated with 0.1 cc. of culture, and the succeeding tubes are then inoculated at appropriate intervals.

If the manipulator is sufficiently skilled to make inoculations and transfers at 15 second intervals, as at present recommended in the standard procedure, the total number of dilutions including the phenol dilutions, that can be carried through a test simultaneously is 20. Five of these are necessary for the phenol, 1:80 to 1:120 inclusive, leaving a maximum of 15 for the disinfectant. This will permit the employment of two of the columns of the table of final dilutions if necessary. In practice, however, it will seldom be found necessary to extend the range over more than one complete column or eight dilutions which with five phenol dilutions, gives thirteen in all. This will permit the making of inoculations and transfers at 20 second intervals, with one minute leeway at the end of each round, a safer and more comfortable schedule. For the beginner, 30 second intervals are recommended, which permit the carrying of ten dilutions simultaneously. Whatever the interval decided upon, it is quite desirable that a plan of the test showing the dilutions to be used, intervals between inoculations, and times of making subcultures be carefully laid out on paper so that there shall be no confusion in these matters during the actual test. The following will serve to illustrate the value of such a paper plan.

A set of these plans, covering the more common range of working conditions, might well be prepared in standard form for ready reference.

When the tubes have all been inoculated, the inoculator is pushed away diagonally and the loop-holder is drawn up to the edge of the bench and just before the expiration of the time interval, sub-culture

PLAN FOR TEN DILUTIONS AT THIRTY SECOND INTERVALS.

	Seeding Tube No.	Dilution	Inoculate		5-min. test		10-min. test		15-min. test		20-min. test	
			Min.	Sec.	Min.	Sec.	Min.	Sec.	Min.	Sec.	Min.	Sec.
Phenol	1	1:80	00	00	5	00	10	00	15	00	20	00
	2	1:90	00	30	5	30	10	30	15	30	20	30
	3	1:100	1	00	6	00	11	00	16	00	21	00
	4	1:110	1	30	6	30	11	30	16	30	21	30
	5	1:120	2	00	7	00	12	00	17	00	22	00
Test	6	1:360	2	30	7	30	12	30	17	30	22	30
	7	1:400	3	00	8	00	13	00	18	00	23	00
	8	1:440	3	30	8	30	13	30	18	30	23	30
	9	1:480	4	00	9	00	14	00	19	00	24	00
	10	1:520	4	30	9	30	14	30	19	30	24	30

tube no. 1 is taken in the hand, the plug withdrawn, and a loop dipped perpendicularly into the first seeding tube. At the expiration of the time interval, the loop is withdrawn, and the transfer consummated. The loop is returned to its groove in the loop-holder, the burner moved in place under it and the sub-culture tube given a rapid whirling movement to mix its contents and replaced. Another tube and another loop are then taken in hand for the next transfer.

At the completion of the test, the sub-culture tubes are placed in the incubator, and 48 hours later they are removed, read and recorded.

The A. P. H. A. Standard Phenol Coefficient.

The concentrations of the highest dilutions of the disinfectant which gave negative results in 5, 10, 15, and 20 minutes respectively, are divided by the corresponding concentrations of phenol to obtain a series of four coefficients. The arithmetical mean of the four is taken as the "Mean Phenol Coefficient against Typhoid, 20° C., 5–20 minutes, A. P. H. A." It is recommended that a final report should be based upon the results of not less than three separate tests. This coefficient will be known for brevity as the "A. P. H. A. Standard Phenol Coefficient," but for any other organism, temperature or time ranges that may be employed the word "Standard" will be omitted and the full expression given. The determination of these special coefficients for special uses is recommended.

Units Employed. It should be observed that the customary procedure of weighing the phenol and measuring the disinfectant by volume, gives a coefficient which is actually expressed in two sets of units. Strictly interpreted, this coefficient gives the relation (under the conditions of the test) between one liter of the disinfectant and one kilo of phenol, or between a gallon of disinfectant and 8.34 pounds of phenol. Comparison upon a weight basis may be obtained by dividing the coefficient by the specific gravity of the disinfectant, or by making the initial 5 per cent stock solution by weight. This latter procedure is necessary in testing a solid substance and if in any case it is resorted to, the results should be expressed as "A. P. H. A. Standard Phenol Coefficient (by weight)." This procedure also permits the study of the disinfectant powers of water soluble gases and the reporting of the results by weight.

Stability of Emulsions. The great majority of commercial disinfectants are prepared by emulsifying coal tar distillates, and it is important that these products should form uniform and stable emulsions when diluted with water. It occasionally happens that poorly manufactured products of this type form perfectly stable emulsions in the range of dilutions used in determining the coefficient, while in a more concentrated solution the greater part of the germicidal power is lost, owing to the breaking down of the emulsion and separation of the active constituents. It is recommended therefore that, when testing this type of preparation, 100 cc. of a dilution of the same strength as that to be used in actual disinfection be allowed to stand in a tall cylinder at room temperature, for 24 hours. There should be no appreciable separation of oily material at either top or bottom.

Occasionally products are found which do not form stable emulsions in the range of dilutions used in determining the coefficient. If the separation is rapid the results of the test may be very irregular, so that it is practically impossible to determine the coefficient. Such a possibility should always be considered in looking for the explanation of irregular results.

The phenol coefficient determined under carefully standardized conditions is be-

lieved to be a reliable means for ascertaining the relative values of that class of disinfectants prepared by emulsifying coal tar distillates. It is also believed to be suitable for the routine control of manufacturing processes and should be employed for this purpose by all manufacturers. With disinfectants of varying chemical or physical nature the simple coefficient may be misleading. This phase of the problem is discussed in detail in Section C, and some additional determinations are recommended, which should prove of value in showing how disinfectants of different types vary under varying conditions of practice.

SECTION C. THEORETICAL CONSIDERATIONS.

Principles of Disinfectant Testing.

In order to make the results of the test somewhat more directly applicable to different types of disinfectants under the varying conditions of practice, and in order further to emphasize the limitations that restrict the use of the phenol coefficient and to remove these limitations as far as possible, the scope of the test has been somewhat extended and certain new biological constants have been made available thereby. The significance of these limitations and of the new data that will be made available by the proposed changes will therefore be discussed in some detail.*

The germicidal power of any disinfectant, as it is usually measured in terms of time to sterilize, is affected by such factors as the specific resistance of the organism, the medium on which the disinfection is carried out, the number of organisms present in unit volume, the concentration of the disinfectant, and the temperature at which the test is made. It is apparent, therefore, that a statement of the properties of a disinfectant must, if it is to be of practical service, describe the effect of each of these variables upon the germicidal power or efficiency. A realization of the difficulty of such a complete study and record of the large number of existing disinfectants and of the utter inadequacy of existing data upon even the simpler disinfectants and the more common pathogenic organisms, led Rideal and Walker (2) to the conception of a coefficient which would measure not the absolute effect of the disinfectant, but its relative effect as compared with some standard substance.

Phenol was chosen for the standard and the relation between the dilution of the disinfectant in question and that of phenol capable of exerting an equal germicidal effect was called the carbolic acid coefficient.

It is evident that if phenol and the disinfectant under examination be equally affected by variations in the numerous controlling factors outlined above, then their relative germicidal values, and consequently the coefficient, will remain unaffected or constant. This would be the case, for example, if an increase in temperature resulted in each case in an equal proportionate increase in the rate of killing, if doubling the concentration increased the rate to the same relative extent in each case, and if the resistances of various strains of organisms, the varying composition of the medium in which the organism is grown or the test made, and the numerous other variable factors, produced the same relative effect upon the germicidal efficiency of the two disinfectants. If all these suppositions were true, then there would be a single phenol coefficient for each disinfectant and the conditions under which the test is made would be immaterial. The early history of the test indicates that this was believed to be the case, and the phenol coefficient is even now almost universally accepted as a measure of the strength of any type of disinfectant against

* For more complete discussion see Phelps, Jour. Inf. Dis. 8, 1911, 27 and Phelps, Amer. Jour. Pub. Health 3, 1913, 53.

any pathogenic organism and under all conditions of practical application. This is particularly shown in the use of the coefficient in specifications, in labeling and advertisements, and in the determination of relative price values.

On the other hand, those familiar with the details of the test are fully aware that there are many possible "phenol coefficients" depending upon the conditions of testing, that particular coefficient which is obtained by testing under the standard conditions, being but one of this number.

It measures, therefore, the value of the disinfectant in question under those particular standard conditions and relative to phenol, and other conditions would furnish other measures of relative value.

Fortunately for the cause of disinfectant testing it seems to be the case that this variation in phenol coefficient is due to the difference in chemical and physical natures of the two disinfectants and that the less these differences between any two disinfectants the more nearly constant will be the relation of their respective efficiencies under variable conditions of testing. Chick* had shown for example that the phenol coefficient of mercuric chloride at 2.5 minutes is 13.6 and at 30 minutes, 550, while on the other hand evidence is accumulating which tends to show that in that group of commercial products made by emulsifying coal tar distillates, the variability is reduced to a minimum.

These products, being unlike a phenol solution, have variable coefficients with varying time and and concentration, but among themselves, the variation is similar so that their phenol coefficients determined under well standardized procedure, giving their true values relative to phenol under one set of conditions, serve to grade them among themselves under all other physical conditions. In this case the phenol coefficients of emulsified coal tar disinfectants do measure the relative value of those products that are somewhat similar in chemical or physical properties, and the greater the dissimilarity among such products or between them and other types of disinfectants, the less reliable is the coefficient as a measure of relative valuation.

It is apparent, therefore, that if disinfectants of different types are to be rated and compared by any single coefficient, the effects upon the coefficient of the more important variables, at least, must be taken into consideration. Just as the complete statement of the electrical conductivity of a metal includes its conductivity at one stated temperature together with the thermal coefficient or effect of varying temperature upon the conductivity, so a complete statement of the phenol coefficient must include the coefficient under fixed conditions and a measure of the effect of varying conditions.

In so far as this effect of variable conditions is in itself constant, as determined by the constancy of certain additional factors to be described, just so far is it permissible to compare the disinfectants under consideration upon the basis of their phenol coefficients. In other cases, and particularly among disinfectants of varying types, a full comparison of properties must involve a further statement of the effect of variable conditions upon the efficiency of the disinfectants tested.

In view of the somewhat general use of the phenol coefficient as a standard basis of reference it would seem desirable to continue this standardized specific measure as a point of departure, with a more complete statement of its limitations than has hitherto been made. It is also highly desirable to extend the practical usefulness of this measure by removing from it certain of the experimental restrictions that have hitherto been imposed, thereby broadening its scope and significance.

The most important restriction is the

* Jour. of Hyg. 1908, 92.

organism used in the test. The trend of the time is strongly towards specific and away from general disinfectants. No further recommendations are made in this connection, however, than to point out the possibility that the coefficient as determined with one organism may have no significance in connection with another and the urgent desirability of extensive studies of various types of disinfectant upon various pathogenic organism. In such a study the general procedure recommended for the typhoid organism should be followed, with such modification as to media and other details as may be found necessary.

The second important variable to be considered is that of concentration. The efficiency of a disinfectant, measured in terms of rate of killing, or time to sterilize a given volume, containing a given initial number, is not proportional to its concentration, but to some power of that concentration depending upon the nature of the disinfectant in question. With phenol the rate of killing varies approximately as the sixth power of the concentration. If, with the disinfectant under study, it varies as the fourth power, and if the concentrations necessary to kill in 2.5 minutes are found to be 1:80 and 1:400 respectively, then those necessary to kill in 15 minutes (one sixth the rate of killing) would be respectively, 1:108 and 1:626, giving coefficients for the two time periods of 5.0 and 5.8. Under the procedure adopted by Rideal & Walker a single time period was adopted. The Lancet method gave some recognition to this variable feature by averaging the two coefficients obtained at 2.5 and 30 minutes and the Hygienic Laboratory method takes similarly the 2.5 and 15 minutes results. In view of the significance of this coefficient variation with the time of exposure it is believed that it should be measured and reported rather than concealed in an average.

To this end it is recommended that separate coefficients be determined at 5, 10, 15 and 20 minutes; the mean of these values being taken as the "mean A. P. H. A., phenol coefficient 20° C., 5–20 minutes," or, for brevity, the "A. P. H. A. standard phenol coefficient"; and that the ratios between the 5 and 10 minutes, and the 10 and 20 minutes values be computed, averaged and reported as the "time ratio."

The time ratio as thus determined bears the following relation to the concentration exponent, R being the ratio of the coefficient determined for any time of exposure, to the coefficient for twice that time of exposure, and n, the concentration exponent, which shows by what power of its concentration the efficiency of a disinfectant varies:

$$\log R = 0.05 - \frac{0.3}{n}.$$

For more ready interpretation of the significance of the time ratio, the following table shows for each value of the ratio R,

Relation between the "Time Ratio," R, the Concentration Exponent n, and the Increase in Germicidal Power of a Disinfectant Resulting from a Doubling of Its Concentration in the Mixture:

Time ratio R	Concentration exponent n	Relative germicidal power of a mixture of double concentration, 2^n
.1	.29	1.2
.2	.40	1.3
.3	.52	1.4
.4	.67	1.6
.5	.85	1.8
.55	.97	2.0
.6	1.10	2.2
.65	1.27	2.4
.7	1.46	2.8
.75	1.72	3.3
.8	2.04	4.1
.85	2.49	5.6
.9	3.13	8.8
.92	3.48	11.1
.94	3.90	15.0
.96	4.43	22.0
.98	5.10	34.0
1.00	6.00	64.0
1.01	6.57	95.0
1.02	7.25	152.0
1.03	8.07	267.0
1.04	9.09	544.0

the corresponding value of n, and the relative increase in the germicidal power of the disinfectant corresponding to a doubling of its concentration. These last named values are given by the expression 2^n, the germicidal value varying as the nth power of the concentration.

The significance of the concentration exponent has to do with the use of a disinfectant in various concentrations. A disinfectant with a high exponent, like phenol, will have its germicidal power increased at a rapid rate with increasing concentration and decreased equally rapidly with increasingly dilution. Such a disinfectant will be said to possess low antiseptic powers for on dilution the germicidal power is rapidly "diluted out." One with a low exponent will increase more slowly in germicidal power with increasing concentration and decrease more slowly with increasing dilution. It would be classed as a good antiseptic. Phenol with an exponent of six is of the first type and mercuric chloride, exponent one, of the second.

A third important variable, carefully controlled in the test of a disinfectant, is the temperature. In order to obtain consistent phenol coefficients it has been found necessary to adopt a standard temperature of testing. The recommended procedure specifies a temperature of 20° C. It is obvious, however, that practical working conditions will not always conform to this standard and, the phenol coefficient being actually dependent upon the temperature selected for the test, cannot measure the true relative value of the disinfectant at other temperatures. It is known that many disinfecting reactions, like chemical reactions in general, have a definite temperature coefficient which measures the proportionate increase in the rate of the reaction (or decrease in time of completion) for a stated increase in temperature. It is important to note the form of this relation. The increase in rate is proportionate, as the temperature increases by equal increments. The physico-chemical law is thus expressed:—

As the temperature increases in arithmetical progression the velocity of reaction increases in geometrical progression. Thus, if a rise of 10° doubles the rate, a further rise of 10° will double it again so that an increase of 20° will quadruple it. The temperature coefficient, usually expressed for a 10° interval, gives the ratio of the rate of reaction at the higher temperature to that at the lower. In the case of disinfection the respective times to complete the reaction may be taken inversely as the rates so that the temperature coefficient for a 10° interval will be the ratio of the longer to the shorter time.

Little exact knowledge is available as to the temperature coefficients of disinfectants but their importance in practical disinfection is such as to justify careful study and record in the case of any disinfectant worthy of serious consideration. By the simple expedient of determining the relative times of sterilization at two different temperatures under otherwise comparable conditions, the temperature coefficient is readily determined. As between two disinfectants, the one with the higher temperature coefficient will show the greater rate of increase in efficiency at higher temperature, and of decrease at lower. A comparison of the temperature coefficients will therefore disclose those disinfectants particularly suited for use at low temperatures or at unusually high temperatures. For use at temperatures above the standard employed in testing, a high temperature coefficient is desirable and vice versa.

It might appear that the examination of a disinfectant is becoming an increasingly serious matter, but it is believed that any simpler formula than that outlined not only fails to describe the disinfectant, but, if applied to preparations of different types may be actually misleading and capable of

doing harm. A disinfectant which has been studied and described in accordance with the principles outlined above, may be said to have had its bacteriological constants fairly well determined. To this end the following determinations are recommended in addition to the standard phenol coefficient:

(a) The determination of the coefficient against disease producing types of bacteria other than B. Typhosus particularly the ones against which the disinfectant is to be used.

(b) The temperature coefficient; and

(c) The concentration exponent or "time ratio."

From a theoretical point of view the phenol coefficient is eminently unsuited as a starting point for the determination of these new constants. In view, however, of its general adoption and legal recognition and of the much greater difficulties of technique involved in a more accurate and fundamental determination of the reaction constants of a disinfectant, the recommendations for the determination of the concentration exponent and temperature coefficient are based upon the recognized procedure.

Determination of the Temperature Coefficient.

That concentration of the disinfectant which killed in 20 minutes and was, therefore, employed in computing the phenol coefficient at the 20 minute period is again taken for the temperature coefficient test. Four identical mixtures of disinfectant and culture are prepared exactly as in the previous case except that two of these are contained in a special temperature bath at 30°$_4$ C. The successive mixtures are made at 30 second intervals, the two 20° tubes being prepared first. At one minute intervals from the time of mixture a subculture is made from each of the two 30° tubes, this procedure being continued up to the eighth set and then continued upon the 20° tubes from the tenth to the twenty-second minute. Incubate, read and record the results as previously. Take the average time to kill at 20° C. from two tests at that temperature and similarly for 30°.

The Temperature Coefficient for Ten Degrees. Divide the least time required for sterilization at 20° (average of two tests), by the similar time at 30°, other conditions being the same. The quotient is the temperature coefficient for 10°. The coefficient for 5° is the square root of the 10° value, and that for one degree the tenth root. The 10° coefficient is usually employed in chemical literature and may be computed from the value for any other temperature range such as x degrees by taking the $\frac{10}{x}$ power of that value.

The Time Ratio and Concentration Exponent. These are related constants and only one of them need be reported. The time ratio is the ratio between the coefficient determined at any time period and the similar coefficient determined at twice that time period. Under the standard procedure divide the 5 minute by the 10 minute coefficient and the 10 minute by the 20 minute coefficient. Average these two quotients and report as the time ratio; compute the concentration exponent by formula or read it from the Table, page 518.

A complete study of a disinfectant must also include its physical and chemical behavior in the medium in which it is to be employed, as for example, its diffusibility or powers of penetration, and especially its chemical permanence. These are matters demanding careful investigation but as they vary from case to case it would be hopeless to attempt to include them in a general specification of the disinfectant. There is urgently needed, however, a comprehensive study of these practical phases of disinfection. Beyond such obvious chemical facts as the failure of acid as a disinfectant in an alkaline medium, of an

oxidizing disinfectant in a reducing medium, or of a heavy metal disinfectant in a precipitating medium, but little is known of the chemical behavior of disinfectants in the media commonly encountered. The surprising effects of common salt upon a solution of phenol and of ammonia upon hypochlorite are but indications of the importance of this whole subject.

Constants to be Reported.

It is believed that a single phenol coefficient is a sufficient basis for a preliminary classification of disinfectants and for the exclusion of worthless trade preparations and that furthermore it forms a reliable basis for the relative valuation of disinfectants of similar chemical and physical nature, particularly the emulsified coal tar preparations. To this end a reputable trade product should always be accompanied by a statement of its coefficient preferably in terms of the "A. P. H. A. standard Phenol Coefficient." This single value, however, gives inadequate indication of the usefulness of all types of disinfectants under other than laboratory test conditions and should be regarded more as a presumption than as direct evidence of quality. The time factor or the concentration exponent furnishes much more detailed information of the action of the disinfectant upon typhoid organisms at various concentrations and ought always to be determined. The temperature coefficient ought also to be carefully studied by an investigator proposing to undertake disinfection under temperature conditions unlike those of the test.

These three tests against typhoid should be considered in preparing specifications, and manufacturers and dealers should be prepared to specify values for the guidance of health authorities and others.

Finally disinfectants intended for special purposes should be standardized against the particular organism in question and the report should so indicate. As far as practicable also the test should be under standardized conditions simulating those of practice and the report should so indicate. In particular, attention must be given to the general chemical nature and reaction of the disinfectant and to incompatible mixtures and interfering chemical reactions.

There remains to be determined and made available a large amount of definite and practical information concerning the action of disinfectants of various types upon various important pathogenic organisms so that the general relationships existing between the relative resistances to each general type of disinfectant shall be available. To this end the most thoroughgoing and complete tests and application must be made by public health research laboratories. Such studies are necessary for the construction and understanding of a proper theory of disinfection.

Wm. H. Park,
H. D. Pease,
F. W. Tilley,
Earle B. Phelps,
Chairman.

A FILING SYSTEM FOR PUBLIC HEALTH LITERATURE.*

ROBERT R. HARKNESS,
Sometime Health Officer, York, Maine
and
C. ELSMERE TURNER,
Instructor in Biology and Public Health, Massachusetts Institute of Technology.

THE following decimal system has been used by the authors in filing pamphlets and other material bearing upon professional subjects with very satisfactory results. It is a brief or skeletal system capable of indefinite expansion or modification for individual needs and is presented here as suggestive rather than perfect.

An alphabetical cross index has been found helpful. It has also seemed expedient to depart from close adherence to the decimal system by listing specific diseases in alphabetical order under the heading "Communicable Diseases."

An inexpensive filing case may be secured by those for whom expense is a consideration in purchasing storage cases of letter size with pasteboard tabs and folders. Books may be arranged in the library according to this general plan. The index of articles in journals which are kept intact and on file is best accomplished by an alphabetical card index on 3 x 5 cards. If preferred, such a slip can be placed in a proper folder of the filing cabinet.

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DIET AND THE HEALTH OF THE WORKER.

The pressure of high prices unites with the awakening of the individual conscience to promote the conservation of food. Under the circumstances we must ask whether widespread malnutrition is a definite danger. Conservation of health and endurance is an ideal which, we hope, need not be sacrificed in the endeavor to save provisions for export. The problem has two aspects, *reduction* and *substitution*.

To cut down the supply of a population without changing the kinds of food in the allowance is to produce two results: people become smaller and a limit is set to their activity. Loss of weight might be salutary for perhaps one-fourth of our fellow-citizens; it would often be undesirable. Restriction in working capacity is not to be thought of. One would be reluctant to urge the cutting down of exercise. It may be noted, however, that protection from exposure to cold and ample hours of sleep appreciably lower the quantity of the required ration. On the whole we must conclude that any marked reduction in food consumption would have an unfortunate effect.

But if we cannot materially scale down our daily portion we can practise substitution to an extent seldom conceived. We can go far in this direction without inviting deficiency diseases. Lusk reassures us by calling attention to the health and power of the Italian peasantry, sustained for generations upon corn-meal, beans, olive-oil, and greens. We have recent evidence that almost any imaginable diet is redeemed and made safe by the liberal addition of milk. This food is so marvelously adapted to the purposes of nutrition that one may say that it is, like faith, "the substance of things hoped for, the evidence of things not seen."

The chief hardship imposed by an unwonted diet is loss of pleasure in eating. This is not an unimportant matter since digestion often waits on appetite. Good cooking is more than ever essential. But especially we need optimism founded in our own resolution and fostered by a variety of recreative interests to keep us sane and steady in this long-drawn trial.

P. G. S.

THIRTEEN THOUSAND LESS CASES OF VENEREAL DISEASE.

Surgeon-General W. C. Gorgas of the United States Army has recently said that in the last six months there had occurred at least 13,000 less cases of venereal disease among the males of military age than there would have been had these men not entered the Army. This means that the ancient bug-a-boo that venereal disease is far more rampant in the military than in the civil population can no longer stand. It means that the control of venereal disease in the Army by the Army is effective. It means, too, that the establishment of those special allied bureaux of the War Department, namely, the Division of Social Hygiene, directed by Major William F. Snow, and the Commission on Training Camp Activities, directed by Mr. Raymond Fosdick, is well warranted, and that these initially experimental, though strongly conceived Bureaux of the War Department have been mightily successful in causing such conditions to obtain that 13,000 of our men, who would otherwise have contracted venereal infection, are now "fit to fight."

This minimal estimated decrease is attributed to four main agencies as applied by the War Department: early treatment (prophylaxis); educational and recreational propaganda, both by pamphlet and lecture, not only among soldiers, but in the civil population among all classes; coöperation of the community and its civil, professional, and social organizations to keep the community morally clean, and hence assure the protection of the health of the soldier; and, lastly, through law enforcement, wherein the Army and Navy, through its representatives see that the laws prohibiting the sale of liquor to men in uniform, the laws of the licensing boards, the laws relating to disorderly conduct and commercialized vice, are strictly adhered to; wherein proper prosecution of offenders of such laws is enforced; wherein legislation which will assist the War Department aims is inaugurated and supported.

To carry out this vast program for the promotion of moral and physical sanitation there has been developed an energetic system, centralized at Washington, but largely directed in detail by section directors, both medical and legal, who being in constant contact with all phases of the problem, direct the efforts of the Department's representatives.

It is comparable to a vast nervous system, where the outward sensations are transmitted to the central nerve ganglia, and there occurs the inevitable reaction. A soldier contracts gonorrhœa, and the case is disclosed by the regimental surgeon. Treatment takes place—a court-martial if the soldier did not report for prophylaxis at one of the many stations (U. S. Dispensaries) in and outside of army camps. A social history record is taken at the infirmary or hospital, and the record forwarded to the proper authority. From this there is obtained the name and address of the girl who infected the soldier and the place where the association took place, and whether or not alcohol was used. If the place of association be a hotel or lodging house, pressure is brought to bear on the community officials—things happen; if alcohol was obtained, more things happen. Then the girl is located and—after persuasion or by other means she submits to

examination. Treatment and often detention results; surely a lesson is taught. Thus is the machinery of the system set in motion.

But state and municipal laws are not as far advanced as the War Department's endeavors. Serious hampering results from the ancient false delicacy relating to the occurrence of venereal disease and its public suppression. State legislatures and public health councils, civil, professional, and social bodies must learn of the true condition of their communities and others; must know of the Army's efforts and object; must know and be powerful and sincere enough to apply the prevention.

The War Department learned well its lesson of the Mexican Border, of the experience of the allied and enemy armies on the continent where hundreds of thousands of troops are unfit because of this social poison. And in the full knowledge of this experience and learning, it has evolved this great movement to prevent infection.

A. D. H.

STORIES FROM THE DAY'S WORK.

Few things are so stimulating to health officers as to exchange stories from the day's work. Public health administration means more than preventive medicine, bacteriology, sanitary engineering and research; it involves also a knowledge of human nature. Many a health officer who knew public health from A to Z found difficulty in his work because he was not able to deal with men. The experiences of others along these lines are very helpful to every sanitarian, and for this reason the JOURNAL has a section entitled, "Stories from the Day's Work."

The *Bulletin* of the Louisiana State Health Department recently published a quotation running somewhat as follows: "If you have a dollar and I have a dollar, and we swap dollars, you and I still have a dollar each. But suppose that you have an idea and I have an idea, and we swap ideas. Now you and I each have two ideas."

Your contributions to this section are invited. The experiences may be about men or things, and should preferably range between 500 and 1,000 words in length.

SURGEON-GENERAL GORGAS REACHES THE RETIRING AGE.

The *Southern Medical Journal* reminds us that on October 3, 1918, Surgeon-General Gorgas will reach the retiring age, sixty-four years.

We are told that the Surgeon-General is in vigorous health. He is at his desk at the War Department at 8 or 8.30 in the morning, and he is one of the last to leave in the afternoon. He walks to and from his work, more than a mile every day, and in the Mills Building was in the habit of climbing up and down the seven flights of stairs several times a day, because he liked the exercise and did not want to wait for an elevator.

The high regard of the public health and medical professions for Surgeon-General Gorgas is well known. His achievements in cleaning up Panama and Havana, and, more recently, his efficient conversion of the Medical Department of the Army into a tremendous organisation have stamped him as a man whom history will remember. The endorsement of Gorgas for a Nobel Prize by the American Public Health Association last year was a well-deserved tribute.

We hope that it will be possible to give the Nation the continued services of Surgeon-General Gorgas, at least during the remainder of the War.

ASSOCIATION NEWS

By the Secretary, A. W. Helrich.

Public Health Administration Section.—The time for the next annual meeting is rapidly approaching, and the executive committee asks for your hearty coöperation in making the program up to the usual standard of excellence for the section. Our aim must be not to secure speakers to occupy an allotted time, but to find time for all of the speakers who have vital messages to bring to the section. Time-worn subjects must be avoided unless the subject matter is absolutely new or is presented from an entirely new viewpoint. Every speaker must feel that his topic is so important that no member can fail to hear his address without regret.

We will plan for enough section meetings to give everyone an opportunity to place new discoveries, experiences or ideas before the members but we will not pad the program. We feel that if a message is important enough to interest our members the speaker will ask for a place on the program, and we now appeal to every member of the Association to bear this plan in mind and to communicate with the section secretary promptly in regard to any subject that in his opinion should appear on the program. This, above all the years, is the year for volunteer service in the dissemination of health knowledge. C. H. Wells, Secretary, Montclair, N. J.

ANNUAL MEETING PAPERS.

Those who wish to offer suggestions of subjects and speakers for the next annual meeting are requested to communicate with the program chairmen:

Laboratory Section—Dr. R. B. FitzRandolph, State Department of Health, Trenton, N. J.;

Public Health Administration Section—Mr. Chester H. Wells, Montclair, N. J.;

Vital Statistics Section—Mr. Richard C. Lappin, Bureau of the Census, Washington, D. C.;

Sanitary Engineering Section—Mr. A. E. Fisher, 30 Albernarle St., Rochester, N. Y.;

Sociological Section—Dr. Ira S. Wile, 230 West 97th St., New York City;

Industrial Hygiene Section—Dr. Francis D. Patterson, 506 Kunkel Bldg., Harrisburg, Pa.;

Food and Drugs Section—Dr. James O. Jordan, 1104 City Hall Annex, Boston, Mass.

Milk Report Supply Exhausted.—The 1916 report of the committee on Standard Methods for the Bacteriological Analysis of Milk is out of print. A new report is expected and if presented, will be published shortly after the annual meeting in October.

The following were elected to membership in the Association in June, 1918:

Equitable Life Assurance Society (Corporate Member), New York.

Effie L. Lobdell, M. D., Chicago, Ill.

Stewart G. Thompson, State Board of Health, Jacksonville, Fla., Statistician, Bureau of Vital Statistics.

Wm. H. Bryan, M. D., State Board of Health, Jacksonville, Fla.

Philip S. Doane, M. D., Philadelphia, Pa., Director Health and Sanitation, U. S. Shipping Board.

J. Dale Graham, Columbus, Kans., County Health Officer.

Eliza J. Dadmun, M. D., Boston, Mass.

John L. Newmann, Madison, Wis., Instructor, Medical Bacteriology, University of Wisconsin.

Ernest T. Manning, M. D., Omaha, Neb., Commissioner of Health.

C. W. Milliken, M. D., Barnstable, Mass., Health Officer.

J. W. Lauck, M. D., Olsburg, Kan., County Health Officer.

W. S. Prout, M. D., Concordia, Kans., County Health Officer.

C. B. Martin, M. D., Baltimore, Md., Medical Supertintendent Baltimore Dry Docks.

F. M. Coffman, M. D., Ford, Kan., County Health Officer.

Lieut. Chas. D. Shelton, Topeka, Kans.

J. J. Entz, M. D., Hillsboro, Kans., County Health Officer.

C. S. Kenney, M. D., Norton, Kans. Superintendent State Tuberculosis Sanitarium.

Ernest D. Williams, M. D., Kansas City, Kans.

C. W. McLaughlin, M. D., Kansas City, Kans. City Health Officer.

A. C. Gulick, M. D., Goodland, Kans., County Health Officer.

B. F. Jeffers, M. D., Francis, Kans., County Health Officer.

Helen C. Reilly, Quincy, Mass., Public Health Nurse.

Harry S. Wagner, M. D. Pressmen's Home, Tenn., Physician.

Frank Knause, M. D., Brooklyn, N. Y., Deputy Commissioner of Health, New York City.

Charles E. Gabel, Ph. D., Galveston, Tex. Instructor, Bacteriology, University of Texas.

Charles A. Neafie, M. D., Pontiac, Mich. Health Officer.

George E. MacArthur, M. D., Ipswich, Mass., Board of Health.

John T. Myers, Omaha, Neb., in charge of Bacteriology and Public Health, University of Nebraska.

Arthur G. Warr, Prince Albert, Sask., Sanitary Inspector.

Eli Grimes, M. D., Des Moines, Iowa.

Dutchess County Health Association, Poughkeepsie, N. Y.

*

Board of Directors Meets.—An important meeting of the board of directors was held at Chicago on June 13, 1918. The following directors were present: Dr. Hastings, Dr. Frankel, Dr. Evans, Dr. Peter H. Bryce, Dr. Guilford H. Sumner, Dr. J. N. Hurty, Dr. Hoyt E. Dearholt, Dr. John D. Robertson, Dr. Oscar W. Dowling, Dr. P. S. Schenk, Dr. B. L. Arms, Dr. Henry Boswell, Dr. W. C. Woodward, Dr. Donald B. Armstrong, and Mr. A. W. Hedrich.

The president first called upon Dr. Frankel for the report of the treasurer. Dr. Frankel in presenting his report called attention to the fact that for the first time in years the Association was entirely out of debt, and in fact had a balance on hand in bank of about $4,000.

The secretary, Mr. Hedrich, submitted a short report, supplementing the remarks of the treasurer.

Dr. Frankel and Dr. Hastings reported communications with the Rockefeller Foundation, and stated that indications were that the Rockefeller Foundation probably would not immediately grant the subsidy applied for by the American Public Health Association.

Medical Milk Commissions.—Dr. Otto P. Geier appeared before the committee with the suggestion that the American Association of Medical Milk Commissions be amalgamated with the American Public Health Association. Upon motion of Dr. Evans it was voted that the American Public Health Association appoint a committee to meet with the committee from the American Association of Medical Milk Commissions upon this subject. The president appointed Dr. William C. Woodward as convener of the committee with authority to add to the committee.

Corporate membership.—The subject of corporate membership was next considered in great detail. The secretary reported corporate memberships taken out by the following insurance companies: *

Metropolitan Life.
Prudential Insurance Co.
Mutual Life of New York.
Equitable Assurance Co.
Columbian National Life.
New England Mutual Life.
Travelers Insurance Co.
Union Central Life.
Canada Life.
Sun Life.
Confederation Life.
Policyholders Mutual Life.
North American Life.

In view of the results thus far secured, Dr. Frankel spoke at length upon the need of an active campaign during the summer to interest other life insurance companies and fraternal orders. To this end he suggested that committees be appointed to attend the meetings of the American Life Convention and the National Fraternal Congress, to be held during the summer. He stated that during the winter he had spoken to Dr. Gerard, the president of the National Fraternal Congress, who was cordial in his attitude and believed that it would be possible to interest the individual societies of the National Fraternal Congress to become corporate members of the Association.

Dr. Frankel concluded his remarks with an urgent appeal that each director take a personal active interest in the work of the Association and

* Since the meeting, the Federal Life and Illinois Life of Chicago, and the Fidelity Mutual of Philadelphia have joined.

endeavor to secure not only corporate members but individual members. He suggested that a letter be sent out by each member of the Association, connected either with a fraternal order or a life insurance company, to the officers of the fraternal order or life insurance company, to which he might belong, asking that the organization might become attached to the Association as corporate member.

It was voted that a committee composed of the president, the treasurer, and Dr. Evans, communicate with life insurance associations with a view to securing representation at their meetings and of securing their coöperation.

It was voted that every director be requested to bring the question of corporate membership to such home offices of insurance companies and fraternal organizations as are situated in his district. Upon motion of Dr. Frankel it was voted that a letter be sent to every member of the Association asking him to communicate with the grand lodges of such fraternal organizations of which he may be a member.

The secretary was instructed to furnish a list of the companies to each director, and also a memorandum concerning the procedure of obtaining corporate memberships.

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The president and secretary reported conferences with Mr. Hockenbury, of Harrisburg, Pa., concerning a campaign for increased memberships and for increased donations to the Association. Dr. Frankel also outlined briefly a proposition of Mr. Simpson, of New York City, for a compaign relating to methods of publicity. No action was taken upon either of the plans submitted.

*

Administrative Force.—At this point Dr. Frankel stated that if the Association was to continue and to grow, it was necessary to completely reorganize its administrative force. Up to the present, owing to limited funds, the Association was unable to engage but one secretary, who was assigned manifold functions. Among other things, he was the Administrative Head, Editor of the JOURNAL, the Membership Solicitor, the Publicity Manager, and the Advertising Man. In Dr. Frankel's opinion, the Association should gradually place each of these functions in the hands of an expert. This meant, of course, an increase in the administrative staff. For the present it was desirable to limit this increase in staff to the engagement of one field secretary who should spend his time during the summer in attempting to secure corporate and other memberships. If funds permitted, another such field secretary might be employed.

Upon motion of Dr. Dowling it was voted that the Executive Committee be authorized to employ some one for promotion work forthwith, and a second person if results warrant.

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At this point Dr. J. D. Robertson extended an invitation to the directors to visit the Municipal Tuberculosis Sanatorium. It was voted to accept this invitation with thanks.

Dr. Evans presented a plan for reorganization of the Association. Upon the motion of Dr. Sumner it was voted to appoint a committee to re-draft the constitution. Dr. Evans was appointed chairman of this committee with power to add.

The secretary indicated the status of the move to incorporate the Association and presented a resolution designing to conclude the procedure.

However, upon the motion of Dr. Evans it was voted that the Board of Directors recommend to the annual meeting of the Association that the matter be concluded by the vote of the Association and that in the meanwhile the laws of Massachusetts be investigated as to requirements concerning the place of annual meeting.

It was voted that the advisory editorial board be requested to investigate the cost, makeup, and other contingencies of a popular public health journal and report at the next meeting of the directors.

It was voted to provide a commercial exhibit at the next annual meeting and to instruct the Executive Committee to proceed forthwith.

It was voted that we extend a vote of thanks to Dr. A. R. Reynolds and to Mr. Will C. Braun for their generous efforts in this connection.

The meeting then adjourned.

PUBLIC HEALTH NOTES

Abstracts by M. P. Horowitz and David Greenberg.

Growth Promoting Properties of Corn and Wheat.—The "highly milled" products are without exception inferior in dietary value, as regards growth, to foods prepared from the whole grain. "White" bread made from "highly milled" flour was found to be deficient in antineuritic and fat soluble vitamine, and also deficient in adequate protein and inorganic salts. The authors conclude that bread made from "whole wheat" flour or old-fashioned corn meal should be used in preference to "white" bread and "highly milled" corn foods, whenever the diet is restricted to these cereal foods to the more or less complete exclusion of other foods possessing greater dietary values.—Voegtlin, C., and Myers, C. N., *Public Health Reports*, May 31, 1918, p. 843. (*D. G.*)

*

The Problems of Nutrition.—At this time, when the food problem is so important to millions of people all over the world, it is worth while to state a few facts regarding nutrition which have been brought out by recent investigations. It is now definitely known that animal foods are no longer the staple foods for protein or fat but that much of the food energy can readily be obtained in vegetable products. It is also known that carbohydrates have a superior value in muscular activity. One of the interesting facts recently brought forth is that the energy output of the body is independent of the condition of the body. Even if the individual has been fasting, the energy call to do a certain piece of work will be the same as though he were in the best nutritive condition. Professor Lusk proved the same point, when he demonstrated that the amount of energy required to do a certain piece of work is fixed, or in other words, requires a definite amount of food, regardless of the nutritive condition of the organism.

It has also been proved that, if the body is placed under conditions favoring a rapid loss of heat, energy will be liberated in excess of the requirements of the work itself.

Two other points recently brought out are that the sedentary or brain worker does not require any supplementary rationing, and that war bread does not produce any pathological results. —*The Lancet*, London, England, April 27, 1918. (*M. P. H.*)

*

Face Mask in Communicable Disease.—The accompanying illustration shows the method of guarding against cross infection employed at the base hospital at Camp Grant, Illinois. "Wrong diagnosis in the examining room," writes Major Joseph A. Capps in the *Journal of the American Medical Association* for March 30, 1918, "may place measles to a scarlet fever ward, or meningites in a clean diagnostic ward."

The cubicle system, now extensively used in Army hospitals, consisting of sheets suspended upon wire between the beds, restricts the dissemination of droplets while the patient is in bed. At Camp Grant, when the patient leaves the bed, he is required to don the cheese-cloth face mask.

The system is said to be very effective in preventing cross-infection.

*

Epidemic Poliomyelitis.—In the *Boston Medical and Surgical Journal* for May 30, 1918, there appears a report of the meeting of the College of Physicians of Philadelphia, held on December 6, 1917. Among others who appeared at the meeting to discuss epidemic poliomyelitis were Dr. Simon Flexner, Dr. Haven Emerson, and Dr. C. H. Lavinder. The disease is becoming more prevalent and is likely to be one of the most

important epidemic diseases of childhood. Wickham showed that the disease is not associated with paralysis in a majority of cases during epidemic times. Normally, however, it is a disease of the central nervous system affecting the meninges and grey matter of the spinal cord and brain. A minute anærobic microörganism has been secured which is supposed to be the causative agent of the disease. This, however, needs confirmation. It is known, however, that the infectious agent enters and leaves the body by the upper respiratory mucous membrane, and is probably transmitted from one person to another essentially through contact. Lumbar puncture in suspicious cases, assists in the diagnosis very much. Six weeks is assumed to be the proper period for isolation and hospitalization seems to decrease the case incidence of the disease. It is unwise to try to prevent adults from traveling when the disease is prevalent. Instead one health officer should notify another of the departure of every child under sixteen. Popular educational publicity is exceedingly important not only in combatting this disease, but other diseases of childhood.

(*M. P. H.*)

Wanted: Food Poisoning Specimens.—In food conservation work one of the most important problems is the determination of safe and unsafe foods. All the available food must be preserved and utilized, and methods must be devised which make for efficiency. This has been made a special research problem by the Department of Preventive Medicine and Hygiene of the Harvard Medical School under a grant from the National Canners Association.

During the past year an effort has been made to get in touch with outbreaks of food poisoning and infections in order that definite knowledge might be obtained as to the origin of these cases. To be of value, reports and investigations must be immediate or else little material can be obtained, and no definite conclusions can be drawn. It has been difficult to get into immediate touch with outbreaks of food sickness, and a renewed effort is being made during the second year of the work with the hope that those individuals who are in a position to do so will immediately report the occurrence of any cases of sickness attributed to food. In this problem there must be great dependence upon those who are practising physicians or health workers and who by the very nature of their work are the first to come in contact with such cases.

If there occurs in your community any case, or cases, which you think are attributable to food in any way, will you not telephone (charges reversed) the Department of Preventive Medicine and Hygiene, Harvard Medical School, Boston, Mass.; telephone, Brookline 2380. It is equally important that you save all specimens of feces and vomitus from the affected individuals, and as large portions as possible of suspected foods. An investigator will then be sent out without expense to the community, and an effort will be made to establish the cause of the trouble.

The boche eagle shall be vanquished; tuberculosis also.

French Anti-Tuberculosis Cartoons.—The cuts on this subject appearing in this issue are from the Tuberculosis Commission to France of the International Health Board. They have been sent through the courtesy of Prof. S. M. Gunn.

Home Care in Tuberculosis.—It is estimated that there are at least 2,000,000 living cases of

tuberculosis in this country, of which 200,000 are in an advanced stage of the disease. Since there are less than 50,000 beds in institutions and sanataria for the treatment of the tuberculous, the country is face to face with the great problem of caring for those who are not in institutions. Is it possible to treat these cases at home? The results of various studies demonstrates that home care, including frequent medical and nursing attendance, instruction in home economics, specially equipped sleeping arrangements, proper care for the child members of the family, sufficient material relief whenever necessary, together with sympathetic and careful guidance of a trained social worker or nurse—under these circumstances—the tuberculous patient in the home can be treated as satisfactorily as in a sanatorium, at no greater expense. Nevertheless, the *Journal of Outdoor Life* believes that institutional care rather than home care of the tuberculous should be emphasized. To obtain the ideal conditions for treatment in the home is indeed extremely difficult.—*Journal of Outdoor Life*, June, 1918. (*M. P. H.*)

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Controlling Tuberculosis in Kent.—The County of Kent, England, has been divided into four districts for the control of tuberculosis. In all there are twenty dispensaries which serve as centers for the diagnosis and observation of cases. Of late, the dispensaries have been used considerably for consultation purposes, the physicians sending many doubtful cases for diagnosis. A certain amount of educative work is carried on at the same time, at all the dispensaries. Specimens of sputum are also examined. Patients requiring sanatorium treatment are treated at the county institution where forty-seven beds are provided. The great difficulty, however, comes in the placing of the recovered patients in suitable work and under proper housing conditions. Much attention is also being given to the problem of contacts, and the recognition of incipient tuberculosis in children. It is maintained that the question of real prevention of tuberculosis is intimately bound up in child welfare.—*The Medical Officer*, April 6, 1918. (*M. P. H.*)

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Philadelphia Makes a Sanitary Survey of Schools.—In a survey of the schools, conducted by the Philadelphia Department of Public Health and Charities, 1,500 classrooms were found to be prejudicial to the health and safety of the pupils. Over 400 rooms lacked sufficient air space and in the same number of rooms, the ventilation facilities were very poor. In 500 rooms there was inadequate light due to insufficient window space. Bad overcrowding was found in 350 rooms. The toilet sanitation was poor in 40 buildings. The drinking water accommodations were poor in 10 schools. The exits were inadequate also in 10 schools. In three schools the fire escapes were unsatisfactory, and in 60 schools proper playground facilities were lacking.—*Municipal Journal*, May 4, 1918. (*M. P. H.*)

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Proprietary Medicines.—Those interested in the patent medicine evil will find the results of a special investigation made by L. C. Scott on "Druggists and Proprietaries," which appears in the *Quarterly Bulletin of Louisiana State Board of Health*, March, 1918, extremely helpful. Some of the author's findings are (1) that the majority of pharmacists are opposed to patent medicines on ethical grounds, but they are compelled by public demand to carry them; (2) that the opinion of pharmacists is divided on the question of whether a drug store could exist without the sale of patent medicines or proprietary remedies. Many seem to hold the opinion that it would be possible if all were of the same mind; (3) that the sale of patent medicines is mainly dependent on newspaper advertisement, and were it possible to suppress this, probably 75 to 80 per cent of the demand would cease. (*D. G.*)

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The Framingham Health Demonstration.—The first monograph of the *Framingham Community Health and Tuberculosis Demonstration* has just been published, and contains a complete outline of the plan and scope of the work, and its organization. Over 5,000 people, or one third of the population, have been given a thorough medical examination, to the end that organic defects might be recognized and that incipient cases of tuberculosis isolated. A complete sanitary survey of the city has been made, which included the study of school hygiene and sanitation; industrial hygiene and sanitation; welfare work in industries, in the home, and in the care of infants; the milk supply, including

a wholesale tuberculin testing of cows, and the question of pasteurization; other food supplies, food stores, and lunchrooms; rural sanitation; vital statistics, including an analysis of records for ten years, a checking up of birth registration, and an attempt to learn the exact tuberculosis death-rate by a social investigation; a sickness survey; a privy and well census, and a survey of conditions relating to the breeding of flies and mosquitoes; a housing study; a Von Pirquet tuberculin survey of children between the ages of one and seven years; the working out of tuberculosis standards; a thorough organization of local health work; and a campaign to spread the gospel of good health by exhibits, lectures, organizations, demonstrations and other accepted methods in health education. The executive officer of the experiment is Dr. Donald B. Armstrong. (*M. P. H.*)

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Municipal Drug Addict Clinic.—What is perhaps the first municipal drug addict clinic has been established at Newark, N. J., by the Department of Health. The clinic is held three times a week. It is free to all sufferers from narcotic addiction, and actual treatment is given. "The theory underlying the principles here given is that the drug addict is suffering from a chronic toxemia. The aim of treatment is to withdraw the accustomed drug with a minimum of distress, in order to make possible the restoration to health without necessitating physical restraint, by the substitution of a milder narcotic, rapid reduction in dose and dilution of the toxic agents and their elimination." The coöperation of the Police Department has been obtained in the endeavors to bring drug addicts to the clinic.—*American City*, May, 1918, p. 437. (*D. G.*)

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The social problem in its widest aspect is simply the problem of human happiness. Making life varied, interesting, and full of zest necessarily rests upon the possibility, not alone of eliminating disease, but of creating a reservoir of physical vitality which will render attractive the various pursuits and activities through which happiness is alone obtained. The happy life is the one in which there is a well balanced expenditure of energy. Fatigue, disease and lowered vitality make for a general drabness and meanness of life because effort then becomes irksome. —F. N. Stapleford: "The Physician as a Factor in Social Efficiency."

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Causes of Infant Mortality.—Analysis of the statistics of the mortality of infants in New York State shows two striking points: (1) Over 55 per cent of the total mortality of children of Russian, Austrian, Polish and Italian mothers was caused by measles, whooping-cough, bronchitis, pneumonia, bronchopneumonia and infantile diarrhea; (2) about 43 per cent of the mortality of children of native mothers was from congenital debility, premature birth and malformations. Therefore, when dealing with the foreign group of mothers the problem confronting us is one of proper feeding and sanitation, while with the native element the causes requiring attention are those resulting from wrong prenatal conditions.—*N. Y. Health News*, May 1918, p. 119. (*D. G.*)

Chouette! un crachoir!

Translation:—(Above.) "Spitting on the ground is prohibited."

(Below.) Capital! Here is a cuspidor!

Late Effects of Venereal Diseases.—The following table from the *Report of the Royal Commission on Venereal Diseases* illustrates the comparative death-rates in 150 families wherein syphilis was known to exist and in 150 poor families from which known cases of syphilis were excluded:

	Number of families studied	Number of pregnancies	Miscarriages and stillbirths	Deaths in infancy	Live children diseased	Healthy children
Group I (syphilis known to exist)						
Number	150	1,001	172	229	390	210
Results per 100 pregnancies		100.0	17.2	22.9	39.0	21.0
Group II (known cases of syphilis excluded)						
Number	150	826	78	94		654
Results per 100 pregnancies		100.0	9.4	11.4		79.2

(*D. G.*)

Omaha Quarantines Venereal Disease.—An ordinance recently passed by Omaha makes it unlawful to expose another person to venereal infection, or to communicate the disease to another person. Physicians, nurses, and hospital attendants are required to report all cases of the disease coming to their attention and places a penalty for failing to do so. Names reported to the Health Department shall be confidential. The Health Officer is empowered to isolate or quarantine persons infected with the disease.—*Toledo City Journal*, May 18, 1918.

(*M. P. H.*)

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Sanitation by Aeroplane.—As sanitary officer of the aviation camp at Gerstner Field, Louisiana, I have to make frequent inspections of various parts of the camp, supervising drainage, filling, or oiling in mosquito work, the operation of the incinerator and similar duties. The most efficient way to accomplish these duties has proved to be by means of the aeroplane, riding as an observer. From the air a view of the entire camp is obtained and the nature of the work being done by the sanitary squads may be seen at a glance. Upon alighting the sergeant in charge can be sent to correct or direct the work. The plane is also used for travel to distant points of the field, or to the gunnery school several miles distant. I believe that this is one of the first instances where the aeroplane has served as a regular aid to sanitation.—James A. Tobey, 1st Lieut., S. C., N. A.

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Acute Infectious Jaundice in the United States.—Acute infectious jaundice has become particularly conspicuous because of its prevalence among the troops in Europe. It is a disease which was not entirely unknown in this country before. The disease is characterized by malaise, prostration, and gastrointestinal symptoms at onset, by fever of varying degree and by jaundice of varying intensity and duration. It is distributed practically all over the world and is supposed to be due to Spirochæta icterohæmorrhagiæ discovered by Inada and his coworkers in 1916. There have been various outbreaks of the disease in this country, and it seems that all ages and both sexes are generally affected. Although many people may have the disease, the fatality rate is very low. At the present time, it is not possible to link up the disease with occupation, and it is not definitely known what the conditions of food supply, water supply, sewage disposal and other factors in sanitation were, when the disease appeared in this country. Before the war, the disease seemed to occur especially among troops, sewer workers, mine workers and in agricultural laborers working in wet soil. The causative agent has been found on wild rats, and so the rodent has been linked up with the disease. It is believed, however, that

no insect plays a part in spreading the disease. The weight of opinion seems to favor the spread of the disease by contact, the spirochætes being interchanged among rats and men, under poor sanitary conditions by means of their urine.—*Public Health Reports*, May 10, 1918.

(*M. P. H.*)

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Special Course for Public Health Nurses.—The health problems created and intensified by the war have made more urgent than ever the demand for well-equipped women to do infant welfare work, anti-tuberculosis work and industrial nursing. In order to assist in meeting this need the Visiting Nurse Association of New Haven has planned to develop and extend the course of special training for public health nurses which it has offered for the past four years.

Through the coöperation of the faculties of the Medical School and the Graduate School of Yale University it has been possible to provide a course of broad and fundamental character, including five months theoretical instruction and four months of field practice. The theoretical instruction will consist of courses in general public health nursing, public health and hygiene, vital statistics, bacteriology, child welfare, school nursing and dispensaries, tuberculosis, mental hygiene, industrial hygiene, sociology, home economics and nutrition, and educational psychology. For the field practice arrangements have been made whereby the students will get experience in branches of public health work not carried on by the Visiting Nurse Association, such as industrial nursing, mental hygiene, school nursing, and medical and social service work in hospital and dispensary. A certificate will be given to students compieting the course. Nurses desiring to take the course should apply to Miss Mary G. Hills, 200 Orange St., New Haven, Conn. (*D. G.*)

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Venereal Disease Control.—In twenty-four states definite arrangements have been made to coöperate with the U. S. Public Health Service in a program to control venereal diseases, and twelve other states have expressed a wish for such coöperation. In practically all of the twenty-three states regulations have been passed which provide ample authority for dealing with the problem according to the plan approved by the Surgeons General of the Army, Navy, and Public Health Service. The campaign in these states follows four principal channels:

(1) Educational: Acquainting the public with the nature of the diseases and the objects desired to be accomplished.

(2) Law enforcement: Securing coöperation of the physicians in reporting cases, and of the police in apprehending prostitutes, vagrants, and such other persons as can be reasonably suspected of having venereal disease in communicable stages.

(3) Propaganda to secure local funds for providing detention homes and hospital facilities for isolation and treatment of venereal-disease carriers who by their habits are a menace to the public health.

(4) Establishment of increased facilities for early diagnosis and treatment.

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Annual Conference of United States Public Health Service.—At the sixteenth annual conference of state and territorial health authorities with the United States Public Health Service, held in Washington on June 3 and 4, a number of important matters relating to the war were discussed. The members of the conference were especially concerned with the influence on public health of the expected shortage in the medical profession. It was the sense of the conference that there must be some reorganization of medical services in the different communities, aiming at the extension of the health center idea with hospital and clinic units. A committee was appointed to take up with the Conference of State and Provincial Health Authorities the question of maintaining the efficiency of Federal, state, and local health agencies during the war.

Among the resolutions passed may be mentioned those endorsing the principle of Federal aid extension in rural sanitation, a federal system of supervision of the health of war industrial centers through coöperation of the Public Health Service with state and local health and labor authorities, and the principles of the Chamberlain-Kahn Bill in regard to meeting the venereal disease problem.

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United States Public Health Service Activities.—To secure better protection of the health of industrial workers, the United States Public health Service has recently undertaken on a

large scale sanitary surveys of plants producing war materials. This work is an extension of previous studies of measures for medical and sanitary care of employes in such industries, and of surveys of hygienic conditions in navy yards. On the basis of the surveys recommendations are made to minimize the risk from industrial hazards and improve the hygienic conditions of the plants. In connection with this work, the Public Health Service is conducting studies of trinitrotoluol poisoning and of industrial fatigue.

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Federal Health Activities Unified.—A most important executive order issued by President Wilson places federal public health activities under the Secretary of the Treasury. In effect, this will broaden the scope of work of the United States Public Health Service. The order does not apply to the health activities of the Army, Navy, Provost Marshal General and certain functions of the Bureau of Labor Statistics, embracing industrial hygiene investigations.

The order, as published in the *Official Bulletin* of July 2, 1918, reads as follows:

WHEREAS, In order to avoid confusion in policies, duplication of effort, and to bring about more effective results, unity of control in the administration of the public health activities of the Federal Government is obviously essential, and has been so recognized by acts of Congress creating in the Treasury Department a Public Health Service, and specially authorizing such service 'to study the diseases of man and the conditions influencing the propagation and spread thereof' and 'to coöperate with and aid State and municipal boards of health':

"Now, therefore, I Woodrow Wilson, President of the United States, by virtue of the authority vested in me as Chief Executive, and by the act 'authorizing the President to coördinate or consolidate executive bureaus, agencies, and offices, and for other purposes, in the interest of economy and the more efficient concentration of the Government,' approved May 20, 1918, do hereby order that all sanitary or public health activities carried on by any executive bureau, agency, or office, especially created for or concerned in the prosecution of the existing war, shall be exercised under the supervision and control of the Secretary of the Treasury.

"This order shall not be construed as affecting the jurisdiction exercised under the authority of existing law by the Surgeon General of the Army, the Surgeon General of the Navy and the Provost Marshal General in the performance of health functions which are military in character as distinguished from civil public health duties, or as prohibiting investigations by the Bureau of Labor Statistics of vocational diseases, shop sanitation, and hygiene."

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Nursing Publications Combined.—The *Bulletin* of the National Association for Public Health Nursing has been combined with the *Quarterly*. The new magazine, *The Public Health Nurse*, will be issued monthly.

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MAINE PUBLIC HEALTH NOTES.

The states of Maine and New Hampshire are coöperating with the United States Public Health Service in the establishment and control of a sanitary zone around the Portsmouth-Kittery Navy Yard. At present the towns in Maine, which are included in this district are Kittery, York, Elliot, South Berwick and Berwick. Dr. Paul Preble, passed assistant surgeon of the United States Public Health Service, has been appointed as deputy state health officer of Maine for the sanitary district in this state. He will have under him the necessary clerical and laboratory assistants, as well as field inspectors, and public health nurses.

The State Department of Health is coöperating with the United States Shipping Board and the city of Bath for the support of a full-time health officer of the city of Bath. On account of the great increase in population in that city, due to the shipping industry, acute sanitary problems have arisen which demand immediate attention from the standpoint of a well-qualified health officer and laboratory worker. Under the supervision of the health officer will be a branch laboratory of the State Department of Health in the city of Bath.

At the last meeting of the Public Health Council of Maine it was voted to establish a division of venereal diseases in the State Department of Health.

Dr. L. D. Bristol, state commissioner of health, has recently been appointed on the following committees: Chairman of the State Committee

for the American Association for the Control of Cancer; Member of the Executive Committee of the Conference of State and Provincial Health Officers of North America; Vice President of the National Tuberculosis Association to represent Maine at the New England Tuberculosis Conference.

MASSACHUSETTS PUBLIC HEALTH NOTES.

The following changes in the personnel of the State Department of Health are announced:

Dr. George T. O'Donnell, State District Health Officer, has been transferred to the Connecticut Valley District, with headquarters at Springfield.

Dr. Lyman Asa Jones, transferred to the Northeastern District, with headquarters at Swampscott.

Dr. Arthur A. Brown, State District Health Officer, has been transferred to the South Midland District, with headquarters at Worcester.

Dr. Merrill E. Champion has been appointed Director of the Division of Hygiene.

New appointments of particular interest in connection with the venereal disease campaign of the Massachusetts state department of health:

At the request of the commissioner of health, Captain Alec N. Thomson, Medical Reserve Corps of the Section for Combating Venereal Diseases, Office of the Surgeon General, War Department, has been detailed to the State Department of Health for a period of three months. Captain Thomson has had a wide experience in establishing and conducting venereal clinic activities in the Army, and before he entered the service was director of the Venereal Clinic at the Brooklyn (New York) Dispensary. In the position of temporary chief of the Sub-Division of Venereal Diseases he will be occupied with the details of the establishment and operation of the State Approved Venereal Disease Clinics.

In this connection it is also announced that Dr. Mary A. Lakeman of Salem has been appointed epidemiologist in the Sub-Division of Venereal Diseases. Dr. Lakeman's principal activities will be the organizing and coördinating of follow-up systems in the State Approved Venereal Disease Clinics.

Dr. W. C. Woodward has resigned as Health Commissioner of the District of Columbia, in order to become Health Commissioner of Boston. He succeeds Dr. Francis X. Mahoney.

Dr. John Weinzirl, formerly of Harvard, Medical School, has been elected secretary of the Washington (state) Association for the Prevention and Relief of Tuberculosis.

MINNESOTA PUBLIC HEALTH NOTES.

Fumigating Dispensed with in Minnesota.—At its last meeting, the Minnesota State Board of Health expressed itself as opposed to terminal fumigation in infectious diseases, and urged the substitution of thorough practical house-cleaning. Therefore, local boards of health are at liberty, by their own regulations, to continue requiring terminal fumigation for release of quarantine in such cases as they see fit, but this is no longer required by state regulations.

The Minnesota State Board of Health at its recent meeting, created a Division of Tuberculosis and a Division of Child Conservation. This makes seven divisions.

Dr. O. J. Chesley, director of the Division of Preventable Diseases, Minnesota State Board of Health, sailed for France early in June to engage in the Red Cross anti-tuberculosis work in the civilian population.

Venereal Disease Work.—The Minnesota State Board of Health has begun its campaign for the control of venereal diseases under the leadership of Dr. H. G. Irvine, of Minneapolis, who is director of the division.

The educational work is in charge of Dr. Mabel S. Ulrich, who has been engaged in social hygiene educational work for some years.

The social service and protective work is being organized by Miss Charlotte G. Ashbrook, who had considerable experience in social work with venereal cases in Philadelphia.

Arsenobenzol is now being distributed for treatment of indigent syphilitics in the infectious stage. The principal hospitals and dispensaries of the Twin Cities were the first to use this free product. In the rural communities it will be distributed through the health officer or directly to physicians.

The coöperation of law enforcement officials and medical officers of military training places

has been secured, and infections of soldiers have been followed up by the arrest of prostitutes reported as the source of such infections.

Prostitutes are being held for medical examination without bail and committed for workhouse sentences. Inmates of corrective and penal institutions in the Twin Cities have been examined and infected cases put under treatment. Those whose terms expire while they are in the infectious stage will be held under treatment in quarantine until they are no longer a menace to public health.

An educational campaign for the purpose of reaching normal schools and teachers, has already been undertaken. The coöperation of Parents' and Teachers' Associations, and the Women's Council of National Defense, have also been enlisted in the social hygiene educational propaganda, which is being carried out under the supervisor of educational work. Exhibit material has been prepared and circulated. Some fifty thousand pamphlets have been secured, and are being widely distributed throughout the state.

The Minnesota State Board of Health is, in short, undertaking the work of venereal disease control on a very broad basis. The work of the Division of Venereal Diseases includes not only medical, but social service and educational activities, and in addition to this a very active cooperation with city authorities in the carrying out of law enforcement measures.

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MISSISSIPPI PUBLIC HEALTH NOTES.

Dr. W. S. Leathers, secretary and executive officer of the Mississippi State Board of Health and director of Public Health for the State of Mississippi, was elected unanimously to the office of president of the Mississippi State Medical Association in session at Jackson, Miss., May 15.

With the distribution of 30,000 bulletins issued by the Mississippi State Board of Health on "Save the Babies," and the coöperation of every public health officer and club woman of the state promised, Mississippi's Baby Welfare Campaign is already well on the road to success. Activities in behalf of this effort are not confined to the club women and public health officials by any means. Circulation of the bulletin, speeches in behalf of the campaign at church society getherings and social meetings throughout the state, help in getting the proper birth certificates promptly to the local registrars, are only a few of the many ways individuals can do their bit. Dr. R. W. Hall, director of the Bureau of Vital Statistics, has sent out hundreds of letters from his department of the State Board of Health to the club women, urging them to give special attention to the campaign, and the greatest interest is being manifested throughout the state in the baby welfare campaign.

There is a heavy call from all parts of the state for the prophylactic typhoid vaccine made in the hygienic laboratory of the Mississippi State Board of Health, and Dr. C. R. Stingily, the director of the laboratory, has felt constrained to say that the demand for vaccine this year has been heavier thus far than it was during the entire year of 1917. The vaccine manufactured by the State Board of Health is made according to the method used by the United States Army, and is furnished free by the state to any physician in the state who calls for same.

For more than a month two representatives of the Federal Bureau of Vital Statistics at Washington have been in the department of Vital Statistics of the Mississippi State Board of Health, examining the records to determine whether or not Mississippi will be admitted into the Federal registration area. Immediately following the work on death registration, they will take up the efficiency of the registration of births. Dr. R. W. Hall, director of the department of Vital Statistics, has inspected the counties of Simpson, Hinds, Rankin, Forrest, Winston Newton, Choctaw, Attala, Leflore, Bolivar, Quitman and Coahoma, visiting every local registrar in each county. Letters have been sent by the Bureau of the Census to ministers, postmasters, mail carriers and others in every county, in an effort to secure the absolutely correct information in regard to all birth certificates.

The State Tuberculosis Sanatorium at Magee, Miss., under the direction of the State Board of Health, with Dr. Henry Boswell, superintendent, opened in December, 1917, and all of the fifty beds are occupied and there is a long waiting list and the demand grows daily for admittance into the institution. Contracts have recently been let for additional buildings and enlargements of the scope of activities. The legislature

made an appropriation for the building of the institution and an annual appropriation for the upkeep.

The State Hygienic Laboratory is now making the Wassermann test for any physician in the state. Last year the laboratory completed over twenty-two thousand examinations and it is thought that the Wassermann test will cause a very great increase in this number.

OHIO PUBLIC HEALTH NOTES.

New venereal disease regulations of the Ohio State Department of Health went into effect July 1. They require: reporting of cases, with the name of victim and source of infection; quarantine in cases where it is deemed necessary by the state commissioner of health; medical examination of persons suspected of having a venereal disease, in which class are placed prostitutes and persons associating with them, and coöperation of health officials in measures for the repression of prostitution.

The Ohio department has installed a Bureau of Venereal Diseases, under the direction of Dr. H. N. Cole of Cleveland, who is giving his services free in the absence of state funds for venereal disease work. Wassermann examinations have been made by the department laboratories since April 1. More than 1,400 such tests were made during April, May and June.

The first three pamphlets of a venereal disease series have been issued by the department. These three are: "Some Things a Young Man Ought to Know About Sex and Sex Diseases," "How Any Boy Can Develop His Health and Strength," and "Instructing Your Child in the Facts of Sex." Pamphlets for girls and young women are in preparation. Educational placards are also being used. A circular letter asking coöperation has been sent to the physicians of the state.

Whooping-cough was made a quarantinable disease in Ohio by regulations which went into effect July 1. Heretofore the state regulations had required reporting of whooping, but had left the question of quarantine to the discretion of local health authorities. Provision is made in the new regulations that children having whooping-cough may go into the streets, under supervision of a responsible person, if they keep at a minimum distance of five feet from children under fifteen years old and wear arm-bands marked "Whooping-Cough."

Dr. Allan W. Freeman, Ohio state commissioner of health, has been commissioned as a major in the Medical Reserve Corps and for the past few weeks has been awaiting his call to active duty. He will be on leave of absence from his official duties for the period of his military service. Dr. Freeman began a five-year term as head of the recently reorganized State Department of Health of Ohio on October 1, 1917.

Dr. Frances M. Hollingshead, director of the Division of Child Hygiene in the State Department of Health, left that position on an indefinite leave of absence July 1 to engage in child welfare work under the American Red Cross Children's Bureau in France. She is the fourth division head of the department to leave for war service.

Counting Dr. Freeman and Dr. Hollingshead, the Ohio State Department of Health has sixteen members of its staff in war service of one form or another.

A movement to reduce Ohio's typhoid fever prevalence is in progress this summer. A "typhoid fever number" of the *Ohio Public Health Journal*, the State Health Department's official organ, issued in May, discussed the problem in its various phases and urged local health authorities to coöperate with the state in controlling the disease. Ohio's typhoid mortality rate in 1917 was 13.1 per 100,000—the lowest rate on record in the state.

TENNESSEE PUBLIC HEALTH NOTES.

Dr. R. Q. Lillard, secretary of the State Board of Health since 1913, resigned on June 1. Dr. Olin West, director of the Bureau of Sanitation for several years, was chosen to succeed Doctor Lillard as secretary and executive officer.

Dr. H. H. Shoulders, registrar of Vital Statistics of the Tennessee State Board of Health for the past five years, resigned on June 1, having entered the Medical Reserve Corps of the United States Army, in which he holds a commission as Captain.

Dr. A. V. Keebler, field director of the Bureau of Sanitation of the Tennessee State Board of Health, is now serving in the Medical Reserve

Corps of the Army with a commission as Lieutenant.

Dr. W. S. Rude, for four years a field director of the Bureau of Sanitation of the State Board of Health, has resigned to enter private practice.

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VIRGINIA PUBLIC HEALTH NOTES.

Dr. Lewis E. Harvie, a member of the Virginia State Board of Health for twenty-five years having been a member of the old board before the reorganization in 1908, died at his home in Danville, Va., on June 17. He had been a resident and practicing physician of Danville for more than forty-seven years. He belonged to the old school of gentleman and doctor, but was keenly alive to the progress made in his profession and kept well abreast of the times.

The first sanatorium in the South for the treatment of negro consumptives, the Piedmont Sanatorium, has been opened in a beautiful location near Burkeville, Va. The staff and equipment are adequate for the care of forty-patients at present, which will be increased to eighty in the next three months.

Under the direction of the State Board, a sanitary inspection of the state was started the last week in June. It will be conducted in the field by a number of advanced medical students who will follow itineraries and make investigations under the supervision of the commissioner. The inspection will cover every phase of public health problems and will not be completed for probably two years. The results obtained will be made the basis of a report to the state legislature looking to possible legislation in the interest of public health work.

A state-wide health campaign has also been begun. In addition to the customary channels, other forms of publicity will be employed, especially letters to state, city and county officials, calling upon them to enforce the health laws and support public health work. A number of physicians and nurses will spend the greater part of the summer lecturing and demonstrating at the several normal schools in Virginia in an effort to reach teachers in the most effective way.

The Bureau of Vital Statistics of the State Board has successfully prosecuted the fifth physician for failure to report births in conformity with the law. He is Dr. W. H. Lewis, of Lawrenceville, Va.

Alvah S. Holway has been appointed acting chief engineer to the board in place of Richard Messer, who was called from his work here into the Federal service. Mr. Holway was until recently associated with I. W. Pratt, consulting engineer, of Cleveland, Ohio. He is a graduate of Dartmouth College and of the Massachusetts Institute of Technology.

Dr. W. A. Brumfield has relinquished his post as assistant commisssioner to become acting assistant surgeon of the United States Public Health Service, with headquarters in Richmond, Va.

Under the direction of Miss Agnes D. Randolph, executive secretary of the Virginia Anti-Tuberculosis Association, a summer campaign has been begun for the care of the men rejected by the draft boards and the men sent home from the cantonments as being tubercular. Miss Mary Summerville Gammon is field director and Miss Hulda Naw is field nurse in this work.

Dr. P. S. Schenk has been elected president of the Norfolk Medical Society.

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WISCONSIN PUBLIC HEALTH NOTES.

By appointment of the State Board of Health, Miss Katherine E. Wattawa of the laboratory staff of the Minnesota State Board of Health, has assumed charge of the state branch laboratory at Rhinelander, Wis., in place of A. A. Sliwinski, who has entered the army medical service.

Miss Olive Andrews of Oshkosh, Wis., has resigned from the staff of the Toledo, Ohio, hospital, to become subdirector of the new state coöperative laboratory at Oshkosh.

Miss A. B. Schmidt, acting health officer of Racine, Wis., has been ordered to report at the Red Cross camp at Nitro, W. Va., for service as a nurse in army camps. City officials were unsuccessful in efforts with Washington officials to retain her until next fall to permit fulfillment of plans for baby welfare work in Racine during the summer.

The Milwaukee Health Department will conduct a survey to learn the effect of factory conditions upon workers who are below and above the draft age. Notation will be made also upon sanitation and the effect which "speeding up" has had upon employes.

Basing their appeal upon the fact that 434 enlisted men have been returned to Wisconsin from cantonments because of tubercular infec-

tion, the women's committee of the State Council of Defense has addressed all county boards asking establishment of county sanatoria for the better protection of civilian health. Jefferson County was the first to respond, promptly appropriating $50,000 for a tuberculosis sanatorium. Ashland, Bayfield and Iron counties have appropriated funds for a tri-county sanatorium on the shore of Lake Superior in Bayfield County.

The commission council of Green Bay, Wis., has reëstablished the position of city nurse and reinstated the nurse, besides enlarging the functions and coördinating the office more closely with the health department. This move followed a popular protest against the council's action in abolishing the office.

The Milwaukee Health Department will establish a downtown clinic for the treatment of venereal diseases.

The Racine, Wis., health officials have established a rule that no floral tributes may be taken into a home where a death from dangerous communicable disease has occurred, and henceforth all flowers in such cases must be sent to the undertaker for conveyance to the place of burial.

Dr. S. Berglund has been appointed commissioner of health of Marinette, Wis., to fill the unexpired term of Dr. S. P. Jones, deceased.

Figures published by the Census Bureau give Milwaukee rank as tenth among large American cities having the lowest death-rates.

Dr. Gustaf Windesheim has been reëlected president of the Kenosha, Wis., board of health.

Dr. W. L. Holt, the new full-time health commissioner of Beloit, Wis., has recommended the employment of an assistant for dairy, restaurant and food shop inspection, and the publication of a health bulletin to fill a need for education of the citizens in personal and public hygiene.

Registers of deeds of Wisconsin, meeting at Milwaukee recently, urged the great need for a standardized legal blank for registering vital statistics. The diversity of form was said to hamper even the operation of the selective service law. With many forms for registering births, for example, some forms become obsolete, and a new register seeking to find the information wanted is often unable to do so, leaving the applicant without means of proving his correct age. The association adopted a resolution to petition the next legislature to adopt uniform registration blanks.

An outbreak of scarlet fever halted the baby census at Two Rivers, Wis., and weighing and measuring of children were temporarily discontinued.

The Milwaukee pasteurization ordinance is now pending in the courts, a group of milk dealers who furnish only 5 per cent of the milk sold in the city having enjoined the enforcement of the measure. Health Commissioner George C. Ruhland expects the ordinance will be upheld.

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NEW YORK STATE PUBLIC HEALTH NOTES.

The annual conference of Health Officers of the State of New York was held at the Grand Union Hotel, Saratoga Springs, June 25 to 27. The meeting was opened with an address by the State Commissioner of Health, Dr. Hermann M. Biggs, who outlined the progress that had been made since the reorganization of the Department four years ago. Dr. Biggs called attention to the increased death-rate and the decreased birth-rate in the civilian population of the belligerent countries of Europe and to the fact that there were 20,000,000 less people living in those countries than would have been living if the war had not occurred. In addition he pointed out that there were at least 10,000,000 individuals handicapped for life or totally disabled as a result of injuries and disease due to the war. He indicated to the health officers that they had it in their power to render a most conspicuous service to the State and the Nation in their chosen field of work, a service as genuine and important and far greater probably in extent than any they could render on the battle fields of France.

Governor Whitman expressed his sincere interest in public health work and emphasized his appreciation of the importance which public health bears to the happiness of the people and to the successful economical development of industries. By means of efficient public health work in New York State the death-rate per 1,000 of population has been cut exactly in half in the last twenty-five years. The Governor pointed out that this reduction means 65,000 fewer deaths and 650,000 less cases of serious illness per year, as would have been the case had the old death-rate persisted, and called attention to what this saving in life and health

means to the state at the present time. The Governor stated it to be his opinion that the official, high or low, who, for the promotion of selfish political aims interferes with public health activities and administration to the detriment of their efficiency is playing with human lives. He begged the health officers in considering the question of military duty to give due weight to the fact that the health of the national army is directly dependent on the health of the civil population from which it is recruited and by which it is surrounded until it leaves this country.

Among the other distinguished guests were Dr. Simon Flexner of the Rockefeller Institute, who spoke on "Some of the Medical Problems of the War," and Dr. Rufus Cole, who discussed "Pneumonia as a Public Health Problem."

At the war service dinner of the New York State Sanitary Officers Association, Col. Victor C. Vaughan was the speaker of the evening.

The American Red Cross was represented by Mr. Alexander M. Wilson of the Bureau of Civilian Relief. During the Symposium on "Child Hygiene," addresses were made by Miss Julia Lathrop of the Children's Bureau of the United States Department of Labor, Dr. Josephine Baker, director of the Division of Child Hygiene, New York City Department of health, and Dr. Charles Hendee Smith of New York City.

"Venereal Disease" was discussed from the standpoint of the diagnostician, by Dr. John A. Fordyce of Bellevue Medical College; from the police standpoint by Major Chandler of the State Police; and from the legal standpoint, by Mr. Joseph A. Warren, counsel of the State Department of Health.

The conference was attended by 552 health officers, representing 721 health districts of the state.

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Mr. Fenimore D. Beagle, executive clerk of the New York State Department of Health, who was taken critically ill with pneumonia on April 22, is now convalescing.

Mr. Beagle has been connected with the Department for over twenty-five (25) years and has never previously lost a day through illness.

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National Safety Council Convention.—The date of the St. Louis meeting has been changed from the week of October 14, 1918, to the week of September 30. A conflict with the meetings of the American Public Health Association is thereby avoided.

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Mr. Murray P. Horowitz of the Department of Biology and Public Health of the Massachusetts Institute of Technology has been appointed instructor at Wellesley College, to give a course in public health laboratory methods. The course is designed to meet the demand for women bacteriologists.

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Menus for National Needs. *Annie L. Weeks. University of Rochester and Mechanics Institute, 1917. 15 pp. Price, 10 cents.*

In our present food crisis, the need of reducing the wheat, fat, meat and sugar in our diet is very great. How can this be done without the sacrifice of health, attractiveness and palatability? This bulletin was published as an attempt to meet this need and should prove exceeding helpful to those who must prepare dietaries. The meals are planned for a family of five, fuel values are indicated for each article of food and a number of simple recipes are also given.

D. Greenberg.

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P-Nitrophenol as an Indicator in Water Analysis.—Although methyl orange and p-nitrophenol are equally sensitive as indicators in estimating the acidity of natural waters, the color change of p-nitrophenol renders its use more suitable in the case of turbid waters. P-Nitrophenol is not altered by boiling with water under pressure.—A. Goldberg, *Chem. Ztg.*, 41, 599 (1917). *Jour. Chem. Soc.*, 112, II, 498; *Chem. Abst.*, 12, 839 (1918).

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GENERAL

Mr. George A. Johnson, consulting engineer, New York City, has been commissioned a major in the Quartermaster's Corps, National Army. He will be attached to the Construction Division, Maintenance and Repair Branch, with headquarters at Washington.

Dr. Minna Mary Rohn has been appointed health officer of the Lake George Health District, of New York State. The appointment

was made on the basis of a recent Civil Service examination.

Dr. C. P. Fryer, of Jacksonville, Florida, has accepted the position of health officer of Pitt County, North Carolina.

Dr. Charles E. Low has resigned as health officer of Spartanburg, South Carolina, to become health officer of the joint board of health of Wilmington and New Hanover Counties, of North Carolina. He succeeds Dr. Charles T. Nesbitt, who has removed to Akron, Ohio.

The appropriation of the North Carolina State Board of Health for 1918 has been fixed at $4,050.

Mr. Mayo Tolman, director of the Division of Sanitary Engineering of the West Virginia Department of Health, has prepared a sanitary survey of Charleston, West Virginia. Copies can be obtained from the Charleston Survey Commission, Mr. Israel Bettan, secretary, at twenty-five cents per copy.

Dr. W. H. Coon has been appointed by the Emergency Fleet Corporation to superintend the sanitation of shipping yards.

The following persons have been appointed district sanitary engineers for the Emergency Fleet Corporation: Mr. C. E. Turner; Mr. M. K. Newman; Mr. George H. Shaw; Mr. J. L. Ludlow; Mr. Don W. Bingham; Mr. S. A. Greeley. Mr. W. S. Stevenson will be engineer at the main office in Philadelphia.

BOOKS AND REPORTS REVIEWED

The Sanitary Code of the State of Connecticut.—The newly organized health department of the state of Connecticut has just issued Chapter I of the Sanitary Code dealing with communicable diseases. In many respects this chapter is a departure from the sanitary codes which have been issued heretofore. An exhaustive list of definitions of terms used contains such new words as *period of communicability, restriction of movement* and *concurrent disinfection.*

Because of the high degree of communicability of certain diseases as smallpox and poliomyelitis, special precautions against their spread must be taken and Regulation 7 provides that, "Every physician or professional attendant having under his care or observation a person with an illness presumably a communicable disease shall introduce such precautions as are necessary to prevent the spread of the infectious agent until a diagnosis is established, or report such case to the local health officer, *Provided*, when an illness is presumably cerebrospinal meningitis, diphtheria, poliomyelitis, scarlet fever, smallpox, typhoid fever, he shall report such suspected case to the local health officer without waiting for a diagnosis."

Another departure in the formulation of regulations concerning the duration of isolation of communicable diseases is contained in Regulation 15, which deals with minimum periods of communicability. For instance, the minimum period of communicability of cerebrospinal meningitis is declared to be "during the clinical course and until the specific organism is no longer present in the nose or mouth."

To minimize the loss of time of wage earners and the hardships brought about by isolation and quarantine, different regulations are prescribed. For example in dealing with such diseases as anthrax, glanders, plague, etc., Regulation 20 requires "the premises where such disease exists to be placarded and all occupants and frequenters of the same shall be quarantined until specific directions are received from the state commissioner of health." On the other hand when the disease is German measles, mumps or whooping-cough, "the person affected shall be subjected to restriction of movement, without placard of the room or premises and without quarantine."

In general the Connecticut code is very complete and is intended as a guide to the health officer and physician in controlling communicable disease rather than a narration of ordinances as are so many of our present codes.

D. Greenberg.

Report of the Chairman of the Committee on Medicine and Sanitation of the Advisory Commission of the Council of National Defense. *April 1, 1918.*

In the spring and summer of 1916 a survey of hospitals and sanatoria was instituted by the committee, with the result that information was obtained and turned over to the Committee on Medicine and Sanitation, upon its appointment, concerning the capacity of 1,700 of the leading institutions of the country, their facilities for caring for military and civilian needs, the personnel required for the successful conduct of the respective institutions, and other data of extreme importance.

In the late fall of 1916 the committee was requested by the Surgeon General's Office of the Army to assist that department in arousing the interest of the civilian medical profession in the Medical Reserve Corps, with a view to increasing enrollments in the corps to meet possible war needs.

Enrollments in the Medical Reserve Corps have been increased from 1,800 at the beginning of the war in April, 1917, to over 21,000 at the present time. Of this number more than 15,000 are on active duty.

The Committee on Standardization was authorized February 2, 1917, under the chairmanship of Dr. F. F. Simpson, for the purpose of standardizing essential medical and surgical supplies and equipment, to increase speed and reduce cost of production.

A bill was drafted which is now before Congress, providing for the vocational rehabilitation and return to civil employment of soldiers and sailors disabled in the line of duty.

In conjunction with the Committee for Civilian Coöperation in Combating Venereal Diseases, and the committee on industrial medicine and surgery, the *Child Welfare Committee* has submitted to the General Medical Board resolutions recommending that the board ask the faculties of medical schools to have the industrial diseases, prenatal and obstetrical care, infant welfare, and the venereal diseases made an integral part of the curriculum of the various medical schools, and that members of the faculties avail themselves of every opportunity to impress the importance of these problems from the public health standpoint upon the medical profession as well as the public at large. It has subcommittees on (a) The best graphic methods of teaching child welfare; (b) Food values necessary to children of various ages; (c) Best procedure to recommend to the states in respect to the midwife question in the present war emergency; (d) To consider the advisability of recommending the investigation of institutions for the care of children and the best means of making such investigations.

Advertisers and press association committees were organized by the *Committee for Civilian Coöperation in Combating Venereal Diseases* for advice and coöperation in developing public opinion favorable to the social hygiene program. The governors of all the states were communicated with, urging recognition of the emergency, and drastic action in dealing with venereal diseases. Volunteer speakers have been furnished in coöperation with representatives in civilian communities. Partially as a result of the committee's correspondence with state boards of health throughout the country, thirty-two states have adopted laws or regulations requiring the reporting of venereal diseases; eleven states have organized bureaus of divisions of venereal diseases in their health departments; at least fifteen states provide free laboratory diagnosis; at least six states provide arsphenamin free or at low cost; sixteen states are engaged in educational work; only two states have given no indications of activity in venereal disease campaign.

With the idea of being of immediate and direct benefit to the largely increased numbers of medical officers who had not had military medical experience, and to enable them the better to conserve the health and lives of the fighting men of the United States, the *Editorial Committee* has published in pocket-manual form six textbooks epitomizing the sanitary, surgical and medical experience acquired in the war, and written by men specially qualified by training and by war experience.

Realizing the relation of the alcohol problem to venereal disease, the *Committee on Hygiene and Sanitation*, in April, 1917, recommended to the War and Navy Departments that the zones around camps and cantonments be placed under military control in order to protect the troops from venereal infections, and the action of the War and Navy Departments in prohibiting the sale of alcoholic beverages within the camps and extra-cantonment zones was emphatically indorsed. This committee also has subcommittees on drug addiction, alcoholic control, public health nursing, tuberculosis, and health statistics.

The *Committee on Industrial Medicine and Surgery* is prosecuting a plan for the reduction of preventable deaths and disabilities from accidents and disease, and the provision of healthful places in which to work and healthful homes and communities in which to live.

Immediately upon its appointment in April, 1917, the *Committee on Medical Schools* took steps to survey the medical school situation, for the purpose of conserving the future supply of medical men by inducing the students to continue their medical education in order that their trained, rather than untrained, services might be at the disposal of the Government.

The *Committee on Nursing*, in addition to instituting a publicity campaign aimed to interest young women in nursing as a career in order that they might upon completion of their training fill institutional positions, thereby releasing trained nurses for duty with the fighting forces, has made a direct appeal to graduate nurses to enroll in the Army, Navy, and Red Cross Nursing Services. State committees on nursing have been formed under the woman's committees of the state councils of defense in twenty-seven states. In coöperation with the National Organization for Public Health Nursing, this committee submitted a plan to increase the supply of public health nurses to meet war needs in general, and the "children's year" program in particular.

The *Committee on Research* has conducted investigations of the conditions under which canned foods might become deleterious; of the

question of protectors for the ear drum against the noises of battle; of substitutes for ambrine; of the study of antiseptics and disinfectants; of an antitoxin for the gas bacillus infections, and of many other important problems.

In addition there are committees on dentistry, hospitals, surgery, volunteer medical service corps, and women physicians, all of which are engaged in important military activities.

D. Greenberg.

INDUSTRIAL HYGIENE AND OCCUPATIONAL DISEASE

Abstract by Dr. E. R. Hayhurst, Dr. R. P. Albaugh, and Dr. P. M. Holmes.

To Safeguard Health of Munition Workers.—Announcement is made in the *Official Bulletin* for April 13, 1918, of the appointment of Dr. Kristine Mann to superintend the work of safeguarding the health of women employed in munition factories. Many workers will be needed for this service, and it is planned to obtain them by special training during the summer at a prominent women's college. It is also planned to train "doctors of industrial health" at one of the medical schools. (*M. P. H.*)

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Protection of Health of Munition Workers in Italy. Alice Hamilton in *Monthly Review, U. S. B. L. S.*, January, 1918, pp. 184–194. The Italians appear to have gone minutely into this subject in the three pamphlets which Doctor Hamilton translated. They appear to be possessed by a peculiar fear of hurting the feelings of either the employer or employe in some of their rulings. For instance, the doctor must maintain secrecy as to the industrial sickness he discovers; even in making out his report to the local committee he must only indicate symptoms without stating his diagnosis, although the case may be entirely evident. While he may instruct the worker in prophylaxis against disease, he is forbidden to advise him against entering these dangerous trades. A list of industrial diseases which must be reported is given but the physician may indicate only acute cases of poisoning. There are, however, many excellent provisions such as reducing the number of persons engaged in manual work as much as possible, the providing of work clothes, refectories, printing of instructions, etc. The Italians have also seen the wasteful effects of their hurry earlier in the war and are now increasing their efforts to provide adequate protection to workers.

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Industrial Hygiene at Harvard Medical School.—The Harvard Medical School is prepared to offer courses of instruction in industrial hygiene and facilities to investigate the problems of industry. This is made possible through the foresight and generosity of a group of New England manufacturers, who appreciate the importance of studying the diseases of occupation and improving the conditions of labor.

Boston and its immediate vicinity offers exceptional opportunities for work of this kind. Within a short distance are found a great variety of industries, and the school has the assurances of sympathetic coöperation through an advisory board of business men consisting of:

W. E. McKay, Massachusetts Gas Company and New England Manufacturing Company.

S. Harold Greene, Lockwood, Greene and Company.

Frank J. Hale, Saco-Lowell Shops.

The President of Harvard University has appointed a Committee on Industrial Hygiene which is organized as follows:

Dr. David L. Edsall, professor of Clinical Medicine.

Dr. Reid Hunt, professor of Pharmacology.

Dr. M. J. Rosenau (chairman), professor of Preventive Medicine and Hygiene.

Dr. C. K. Drinker, (secretary), assistant professor of Physiology.

Under present conditions instruction and research in industrial hygiene will center about three subjects, chemistry, physiology and medicine, and in these subjects new departments will be created. In addition to the new facilities so offered, courses will be developed in the pharmacological, sanitary and social phases of industry, supplementing the work of the School of Public Health. Fellowships and scholarships are available for those properly qualified.

Opportunities will be open to three separate groups:

(1) Research workers.

(2) Medical officers for large industries.

(3) Inspectors of industries.

(1) Research Workers. Those who are properly qualified to carry on original investigations may begin at any time, and the facilities and the laboratories at the Harvard Medical School, and the Massachusetts General Hospital, and the practical conditions in many large industries will be available for this purpose.

(2) Physicians who desire to prepare themselves to supervise the health of large bodies of work people may familiarize themselves with the diseases of occupation in the Industrial Clinic directed by Professor Edsall in the Massachusetts General Hospital.

(3) Through coöperation with the School of Public Health of Harvard University and the Massachusetts Institute of Technology, opportunity is afforded to those who desire to prepare themselves for the position of inspector of industrial establishments. Those who comply with the requirements will be granted a Certificate in Public Health (C. P. H.).

Women are admitted as candidates for this certificate and to all the opportunities outlined in this announcement with the exception that they will not be permitted to matriculate for the degree of Doctor of Public Health (Dr. P. H.).

In view of the war conditions alterations in the above plans may become necessary. For information apply to Dr. C. K. Drinker, Harvard Medical School, Boston, Mass.

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Dope Poisoning in Making Airplanes.—A very complete description of the dopes used in varnishing airplane surfaces as well as the results of a careful search of the literature upon the subject is given in this article. The chief poisonous dope, tetrachlorethane, has been eliminated in England. The effects of the various substitute solvents such as benzene, acetone, wood alcohol, amyl acetate and fusel oil is next described. The newness of the industry in America has not yet produced any authenticated cases of tetrachlorethane poisoning. The author fears, however, that even if danger from this be eliminated there will be opportunity for the slow, chronic effects of long continued exposure to large quantities of the other poisons used.—Alice Hamilton, *Monthly Review, U. S. Bur. of L. S.*, Feb., 1918, pp. 37–64.

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Diseases of Occupation in Great Britain, 1917.—The *Monthly Review* copies a table showing the distribution of 707 cases of occupational diseases and 100 deaths which took place, according to official reports made to the Home Office in Great Britain during the year 1917. Practically half of these were due to lead poisoning with toxic jaundice second and anthrax third.—*U. S. Bur. of L. S.*, March, 1918, p. 198.

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Production and Accidents Among Coal Miners.—During the year 1916 the coal mines of Ohio produced 34,526,552 tons of coal, or 6.9 per cent of the total bituminous coal mined in the United States. Of this amount 91.5 per cent was machine mined. The proportion produced by pick mining showed a decrease of more than 2 per cent over the previous year. At the same time motor haulage showed a marked increase as compared with animal and hand hauling. The total employes numbered 41,877. The average production for a pick miner was 659 tons and per machine runner or helper, 9,966 tons. There were reported 108 fatal accidents and 3,560 non-fatal accidents of more than seven days' duration. For these the Industrial Commission paid awards amounting to $382,620.96 not including cost of medical and hospital attention in those establishments which were self-insured. These compensated cases equaled the entire time of 2,999 men for one year.—*Mines and Quarries in Ohio*, 1916, *Industrial Commission*, Columbus, Vol. IV, No. 10.

Lead Poisoning as a Cause of Pernicious Anemia.—Byfield is certain that his patient, a linotyper, who in 1913 showed the typical signs of chronic lead poisoning and in 1917 those of pernicious anemia, represents a true transition from lead poisoning to pernicious anemia, as has been assumed by some previously, particularly in foreign literature. The patient in the end presented the typical case of so-called Addison-Biermer type of true or essential pernicious anemia and the author believes he is justified in concluding that lead was the hemolytic poison concerned.—Arthur F. Byfield, *Illinois Medical Journal*, Feb., 1918, pp. 105–107.

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Industrial Physicians to Assist in the Control of Cancer.—The American Society for the Control of Cancer, in conducting propaganda, has enlisted the aid of physicians and surgeons connected with industrial plants who come in close contact with large bodies of men and women. To assist the project in Massachusetts, Harvard University has established a service for the free diagnosis of cancer including the free examination of pathologic material removed at operation.

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An Industrial Disease Prevention Conference was held March 25, 1918, at Fitchburg, Mass., to promote greater coöperation between the medical profession and the State Board of Labor and Industries in the prevention of industrial diseases. Representatives of the State Medical Society and the State Board addressed the conference urging education of the workers and employers on matters pertaining to factory sanitation. The importance of the occupational history as an aid in diagnosis was pointed out and treating agencies urged to keep a careful record of the occupation of the patient. It is planned to hold similar conferences in every medical district of the state.

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Aid from the Medical Profession in the Prevention of Disease in War Industries.—The general medical profession can be of but little aid in preventing industrial diseases at their source, but assuming that all proper regulations have been adopted to insure the right selection and classification of workers and to prevent overfatigue and diseases at the plants, the next step is that there shall be a prompt recognition of disease as well as over-fatigue that may occur despite these regulations. It is at this point that the aid of the medical profession begins and physicians should familiarize themselves with the new diseases, as well as the older ones, which have made their appearance in connection with the manufacture of modern munitions. The first step to be taken is one of publicity, including repeated meetings of local medical societies to rouse interest in industrial diseases generally, the preparation and distribution of brief but carefully written descriptions of industrial diseases, the inauguration in medical colleges of special courses in industrial hygiene and the prompt reporting of certain classes of cases occurring among workmen in war industries.—Alfred Stengel, M. D., *Medical Record*, April 6, 1918, p. 587.

⚜

Wood Alcohol.—Dangers in the manufacture and industrial uses of wood alcohol have again been recently investigated in New York State and an illustrated seventeen-page pamphlet prepared which summarizes the findings. This dangerous alcohol is found to be used as a solvent usually for shellac in such industries as the manufacturing of artificial flowers, pencils, picture frames, varnish removers and hats of both felt and straw types. Denatured alcohol, denatured, however, oftentimes with wood alcohol, has been substituted in the varnishing of furniture, in the manufacturing of varnish and in brewery vat varnishing. The pamphlet ends with a concise statement of conclusions and rules proposed for safeguarding workers.—*Special Bull. No. 86, N. Y. State Dept. of Labor, Div. of Ind. Hyg.*

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Industrial Physicians and Surgeons Meeting.—Coincident with the meeting of the American Medical Association in Chicago, the American Association of Industrial Physicians and Surgeons held their third annual meeting at the Congress Hotel. A large representation was present. The annual address was made by Dr. Schereschewsky, the retiring president, upon the subject of "The Industrial Physician and Surgeon in the Work of Winning the War." Papers were read by Sir James MacKenzie of London, who made a plea for greater appreciation of the general practitioner; by Irving Clark,

who spoke on hospital experience abroad, among significant statements being, "The industrial surgeon makes good any place you put him because he is used to handling emergencies, and is accustomed to organizing. He fits in." Dr. Francis D. Patterson fathered a resolution calling upon the Federal Government to commission industrial surgeons. Dr. C. D. Selby spoke on "the Importance of Industrial Physicians' Work in Relation to the Medical Profession." Dr. H. E. Mock spoke on "Reconstruction of the War-Disabled." Mr. T. B. Kidner, vocational secretary of the Invalided Soldiers Commission of Canada, stated many practical points, among them being the fact that cases of disability in returned soldiers are divided equally between medical and surgical afflictions and that of those returned to Canada thus far, only about 10 per cent have been found to need re-education. Other papers were read by Lieut.-Col. James Bordley, Jr., on "Reclaiming the Blind from War"; by Dr. F. D. Patterson on "The Employment of the Rehabilitated Soldier in Industry"; by F. W. Keough of the National Association of Manufacturers, on the "Economics of Employing the Handicapped"; by Dr. Graham Taylor on "Physical Defects"; by Major Jos. C. Bloodgood on "Conserving our Man Power"; by Dr. Otto P. Geier of the General Medical Board, Council of National Defense, on "Organization of Industrial Surgeons' Work"; and Douglas C. McMurtrie of the American Red Cross Institute for Cripples. At the meeting, Sir James MacKenzie of London, Dr. Edward Martin of Philadelphia and Dr. Wm. A. Evans, were elected honorary members of the organization. The officers elected for the ensuing year are: Lieut. Col. Harry E. Mock, president; Dr. T. R. Crowder, first vice-president; Dr. Otto P. Geier, second vice-president; Dr. Francis D. Patterson, secretary and treasurer. The Board of directors elected consists of Drs. J. W. Schereschewsky, Washington; D. B. Lowe, Akron, Ohio; E. H. Hanna, Detroit; A. W. Colcord, Clairton, Pa.; H. P. Hourigan, Buffalo; and Judson C. Fisher, New York. An excellent résumé of the meeting is to be found in the June, 1918, issue of "*Hospital Management.*"

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Furunculosis Among Machinists.—Furunculosis and wound infections are unusually prevalent among operatives of lathes and cutting and milling machines who come in contact with cutting compounds and cutting oils. Multiple abscesses, sometimes of a very severe type, and frequent wound infections have been observed among such workers. A study was made by Albaugh and Hayhurst of a number of cases, occurring in a three-months' period, among 1,365 men employed in an Ohio plant manufacturing mining machinery. The men employed in departments using oils and compounds were found to be the ones chiefly affected and all infections were usually more severe among them. There were 84.5 days lost because of furunculosis during a three-months' period, representing a wage loss to the men employed estimated at $303.40. Of the 84.5 days lost, 80.5 days were lost by employes in the two departments mentioned. The total duration of all cases of furunculosis was 557 days, 84.5 days being lost time, the remainder representing 472.5 days of impaired efficiency accompanied by the menace of spread of infection. Samples of cutting oils and compounds showed contamination with pus-forming organisms, one sample showing as many as 110,000 microörganisms per gram of oil. Experiments indicated that neither mineral oils nor cutting compounds are germicidal. At the same time they apparently have little in the war of nutrient properties for supporting bacterial life, inoculations with pus-forming organisms disappearing in them in from a few hours to a day's time. Oils and compounds apparently act as carriers of infection and apparently have also an irritating effect on the skin. New oils and compounds were found to be sterile, but were contaminated in a short time after being used by men expectorating in the machines and by the oil coming in contact with boils and pimples on the arms of operators. Chemical disinfectants, particularly the cresols, are of but doubtful value when used to disinfect oils. The oil apparently exerts some protective influence over organisms in the nature of emulsification. Prevention depends upon the education of employes in regard to expectorating into lubricants and reservoirs, the frequent cleansing of clothing and prompt dispensary care of all wounds and skin eruptions. Where oil is used more than once, heat sterilization is effective. This can be carried out by heating the oil to 140 F. for twenty to thirty minutes.

For individual machines not connected in a common oiling system, intermittent steam sterilization by steam hose or jets is suggested.—Div. Ind. Hyg. Ohio State Dept. of Health *Ohio Public Health Journal*, April, 1918, p. 145.

In connection with the above, Dr. George Thibierge, at a recent meeting of the Paris Academy of Medicine, calls attention to similar lesions abroad—"bouton d'huile" (oil button). They are frequently encountered among the same class of workers mentioned above. The lesions are found on the parts of the body directly exposed to contact with lubricants, and also on parts of the body exposed to oil-soaked clothing. The production of the oil button is favored by the present necessity in industry of using lubricants of inferior quality having irritating properties. It must be considered an occupational malady and not an industrial accident.—*Jour. A. M. A.*, April 27, 1918, p. 1247.

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Effect of the Air Hammer on the Hands of Stone Cutters.—Dr. Hamilton reports the results of her study of this subject in the stone cutting and carving industries in Indiana, Ohio, Massachusetts, Vermont and Long Island City. Among men who use the air hammer there appears very commonly a disturbance in the circulation of the hands and fingers, making them blanched, shrunken, and numb, especially in certain parts. The affliction appears to be a vascular spasm accompanied with discomfort and even pain. Between the spasms the hands and fingers become normal in appearance and usually are not a source of complaint. A so-called spastic anemia is finally set up which is very slow in disappearing—men who have given up the use of the air hammer for many years still may have their fingers turn white and numb in cold weather. Apparently the condition does not impair the skill in the fingers for ordinary interior work, but may make it impossible for a man to do outside cutting or to take up a skilled trade which exposes the hands to cold. The trouble seems to be caused by three factors—long continued muscular contraction of the fingers in holding the tool, the vibrations of the tool, and cold. It is increased by too continuous use of the air hammer, by grasping the tool too tightly, by using a worn, loose air hammer, and by cold in the working place. If these features can be eliminated, the trouble can probably be decidedly lessened.—Alice Hamilton, *Monthly Review, U. S. B. of L. S.*, April, 1918, p. 25.

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High Death-Rate Among Silicia Brick Makers.—The chief inspector of factories reports, through the British Home Office, the results of an investigation into the manufacture of ganister or silicia rock brick in which the incidence of lung diseases showed that during eight years, among an average of not exceeding 60 workers, there occurred 18 deaths from phthisis and 8 deaths from other diseases of the lungs—a death-rate from respiratory diseases alone of 54.2 per thousand. This rate is some six times that of all males in England and Wales from similar diseases. It is estimated that there are 5,000 workers so exposed in about 100 factories. The several places in the process in which dust is inhaled have been studied and recommendations and a suggested code of regulations submitted to control the dust hazard.—Abstracted from *Monthly Review, U. S. B. of L. S.*, April, p. 292.

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Sickness Insurance or Sickness Prevention.—The average loss of time as a result of sickness which amounts to 6.9 working days per year, with an annual wage loss of $500,000,000 to $750,000,000, and the excessive prevalence of physical defects and disabilities recently revealed by the draft examinations, resulting in impaired efficiency and vitality should induce every branch of industry and society in general to give heed to the question of sickness prevention. The argument against sickness insurance, that it leads to malingering, and meager statistics of Germany's experience showing that the number of days lost through sickness has not decreased but increased as a result of this form of insurance are given. Recommendations are made to the effect that a national health investigating commission be appointed to determine the nature, extent and causes of sickness and physical impairment in the United States, and the working out of a practical sickness prevention program.—Sickness Insurance or Sickness Prevention? *Research Report No. 6. National Industrial Conference Board*, 1918. D. G.

STORIES FROM THE DAY'S WORK

Contributions to this section are invited.—*Editor.*

A MEDICAL QUACK.

My first insight into quackery was in 1888 when I went to Alabama, and there found a man travelling through the country, sending ahead of him an advance agent driving a nice vehicle drawn by four gray mules. The envoy pasted on the walls of various places a picture of this man and the wonderful things he could do, with the statement that he would be at a certain place at a certain time.

Finally the quack-in-chief came, presenting a good appearance, wearing good clothes, and driving a pair of gray horses. He sent for me and I went with him to see an old woman in the community who had a large tumor on the neck. She had consulted various surgeons and they were of the opinion that the carotid artery was behind this tumor. I told him it could be removed easily, whereupon he asked me if I would do the operation for him. I accepted, and he handed me $50. I saw that woman pay him $400 in cash and she gave him notes for $600. He tore these notes up and threw them in the road. I asked, "why"? He said "I will never ask them to pay the balance and I will leave this community before long."

His patients always needed "medicine" so he gave them a jug with a mixture containing sufficient *nux vomica* to make it taste bitter; $50 was the charge for one of these. In two weeks this "doctor" left with over $7,000,—more money than the doctors of that town collected in an entire year.

The other day a man dressed in the *ante-bellum* style his hat made in Philadelphia by special order, and his shoes made in Chicago by special order, appeared in Louisiana. He had a diploma issued in 1904 by the Dallas Medical College. Investigation showed that in the early part of 1904 that school was burned, and there was no record of diplomas issued. He showed me his diploma before he knew who I was. A card which he dropped had on it the name of a man who was a contractor in Los Angeles, and the diploma was issued in the name of this man. I succeeded in bringing from him the statement that he knew of 100 of these diplomas that had been sold.

Oscar W. D. Dowling, M. D.,
President, Louisiana State Board of Health.

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FOUR OF A KIND, AND A LONE JOKER.

Some years ago the mayor of a distant city called me to make a diagnosis. When I arrived, he met me at the depot and told me I had better take the next train home. The health officers (there were four) had learned that he had sent for a Chicago doctor, and, as he had done it without consulting them, had threatened to quarantine me if I visited the patient. I said I would risk it.

When the officers learned who I was, they were anxious to get even with the mayor for acting without their advice, and so had threatened the quarantine. The leading physician of the city—a particular friend of theirs—had made a diagnosis of smallpox. They were competent men, but had had little experience with this disease.

The patient, a woman, had been quarantined. The husband insisted that his wife had several times before been attacked in the same way; it was his insistence that the disease was not smallpox that had caused the mayor to send for me. I went to the quarantined house.

The case was clearly one of recurrent exfoliative dermatitis, though I said nothing about my diagnosis until we returned to the office. After a slight struggle they accepted my diagnosis, and I asked them if they wanted me to tell the mayor who was waiting up to hear from me. They did not.

The hour was late. They called up the mayor and told him they wanted to entertain me themselves for the night. They took me to the hos-

pital, where waited the entire staff, among them the surgeon who had made the mistaken diagnosis. He was a man of brains and a royal good fellow. We had a midnight luncheon, and talked until two o'clock. Thus they made certain I would not see the mayor that night. In the morning a health officer was by my side when I visited him, and stayed with me until the train started.

To the mayor I explained that smallpox was all over the state; that he was fortunate to have health officers who would promptly quarantine all cases and enforce vaccination; that commendable precautions had been taken, and that there would be no more cases. I talked fast, and omitted mention of the patient. I told the men to terminate the quarantine, and set the woman at liberty.

Naturally, the men had felt a little revengeful for the mayor's discourtesy, but they were satisfied with the outcome as I engineered it. A more genial group I have never met, and I now count them among my friends although, until called to their city, I had never seen any of them.

HEMAN SPALDING, M. D.,
Chief, Bureau of Medical Inspection, Chicago Health Department.

The Mad Rush.—On one occasion Professor Huxley was late in keeping his appointment in Belfast. Leaving the train, he hastily took a cab and shouted to the cabman, "Drive fast," and away the cab went, till the question arose in the Professor's mind whether he had told the driver where to go, so he shouted to him: "Do you know where you are going?" Whereupon the driver replied: "No Sir, I don't know where I am going, but I am driving fast." Many with whom we come in contact remind us of this incident. They are "driving fast" without knowing where they are going.

PUBLIC HEALTH LABORATORY NOTES

Abstracts by ARTHUR LEDERER, M. D.

New, Practical Colorimeter.—The apparatus consists of two graduated tubes one of which has a lateral tube near the bottom. This lateral tube is connected with a reservoir containing the standard comparison solution. A definite volume of the solution to be examined is placed in the sealed tube and the other tube is filled with the standard solution until the color becomes identical.—E. Moreau, *Ann. fals. 10, 235 (1917); Jour. Chem. Soc., 112, II, 418.*

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Easy Method of Staining Ameba Cysts.—Cysts, which have been killed by heat or alcohol, are stained by aniline dyes more readily than are living cysts. The best stain is a saturated solution of iodine in 70 to 80 per cent alcohol; cysts are stained golden yellow with slightly darker nuclei.—S. Oi, *Taiwan Igakukai Zasshi, No. 174, 249 (1917); Japanese Med. Lit. 2, No. 66, (1917); Chem Abst., 12, 919 (1918).*

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The Color and Decolorization of Water.—A suspension of iron hydrate is recommended for decolorization. It is preferable to bone black.—A. Massink, *Water 1, 78 (1917).*

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The Atropin Test in the Diagnosis of Typhoid Infections.—According to Morris (*Brit. Med. Jour.* 2, 717), the normal individual or the patient ill of diseases other than typhoid infections responds to the administration of atropin with a noteworthy increase in heart rate. In typhoid patients, however, this acceleration either does not occur or occurs to a lessened degree. The authors tested 170 non-typhoid patients with the atropin reaction; 36 per cent of the number examined yielded results characteristic of typhoid. Those cases giving reactions typical of typhoid without any evidence of typhoid existence were distributed over 13 diseases. It is concluded from so high a percentage of discrepancies that the atropin reaction is without especial value in the detection of typhoid infection.—A. Friedlander and C. P. McCord, *Jour. Am. Med. Assoc., 70, 1435, (1918).*

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Effect of Alkaline Glycerin on Smallpox Vaccine.—An investigation of the cause of several failures following smallpox vaccination with a virus that had previously given 100 per cent successful vaccination, led the author to suspect the deterioration of the vaccine. He finds that vaccine ground with alkaline glycerin and allowed to remain at room temperature yielded results inferior to those obtained with neutral glycerin.—J. N. Force, *Monthly Bulletin California State Board of Health*, May 1918, p. 458. *(D. G.)*

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Blood Coagulometer "Biffi-Brooks."—Since the absence of importations have deprived the medical profession and scientists of the possibility of obtaining a number of instruments, it may be of interest to learn that a very satisfactory model of blood coagulometer is manufactured and offered by E. Leitz, Inc., New York, N. Y.

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Canal Zone Water Supply.—The Agua Clara, Mount Hope and Miraflores purification plants have rated daily capacities of 2½, 8 and 15 million gallons respectively, the method of treatment being aeration, sedimentation, rapid sand filtration and intermittent chlorination. Conditions peculiar to the tropical climate necessitate very frequent cleaning of the different basins in the smaller plants in order to remove growths of algæ and harmless bacteria. The Miraflores plant seems to be comparatively free from this objectionable feature. The yearly average amounts of alum used at the three plants in the order named above were, 220, 163 and 179 pounds per million gallons respectively. It was found that the addition of the alum to the water prior to aeration reduced the amount of CO_2 from over 6 p.p.m. to 2 p.p.m. and increased the length of filter runs accordingly. It is claimed that "by the removal of free CO_2 in the

filtered water, a bactericidal action is established which, while not permanent, serves to effe t considerable reduction in the bacteria before the water is consumed." The yearly average B. coli index (number per litre) was for the raw waters about 1,000, and for tap waters about 100. Liquid chlorine was used at the two larger plants intermittently as repairs and supplies permitted. Effective bacterial reduction at the pumps by chlorination was nullified by growths in the distribution mains. Of 1,428 samples of raw, settled and tap waters, presumptive tests were confirmed in 73 per cent of the raw water samples, 57 per cent of settled water samples and 52 per cent of tap water samples. Limnological studies during the year show the presence in the raw waters of numbers of diatoms, protozoa and chlorophyceæ, other organisms not being very numerous. The necessity of floating intakes for tropical impounded water supplies to avoid disagreeable taste and odor is stressed.—*Report on the Water Supply in the Canal Zone for the Year Ending June 30, 1917*, by George C. Bunker, Physiologist. (*B. Cohen.*)

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Use of Rabbits in Pneumococcus Differentiation.—Rabbits were found to be a satisfactory substitute for white mice for differentiating pneumococci types. Three times as much sputum was injected as would have been with mice. The age and size of the rabbit seemed to make little difference.—H. K. Faber, *Jour. Am. Med. Asso.: 70, 1459 (1918).*

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Lacmoid in Bacteriology.—Lacmoid is prepared by dissolving 1 gram of sodium nitrite in 20 cc. distilled water and adding 20 grams resorcinol; the solution is evaporated on a water bath and the residue is heated to a temperature not exceeding 120° C. until no more ammonia is evolved. The residue is then dissolved in water, precipitated by hydrochloric acid, washed and dried. Lacmoid was substituted for litmus in the Drigalski-Conradi medium, 20 cc. of a 2 per cent alcoholic lacmoid solution being added to 2,000 cc. of the medium; the latter was then inoculated with B. coli and the Eberth bacillus. The same results were obtained as with litmus, a red coloration being produced by B. coli, while the blue color was retained in the case of the Eberth bacillus. The reaction was distinct after 24 hours. Lacmoid is preferable to litmus as an indicator because of its constant chemical composition.—Atilio A. Bado, *Anales soc. quim. Argentina, 4, 87 (1916); Chem. Abst. 12, 1065 (1918).*

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Anaerobic Bacteria of War Wounds.—The methods of isolation of these bacteria were obtained by use of the new palladium asbestos apparatus devised by the authors, which as it appears to be by far the best method of growing surface cultures of anaerobes may be described in one of its forms McIntosh and Fildes' anaerobic tin. This apparatus, which is now on the market, consists of a tin some 7 inches by 5 inches with a lever-off lid. The junction between tin and lid is sealed with plasticine. A small hole is drilled in the centre of the lid and into this is fitted a small brass stop-cock such as is used for model steam engines; the joint is made tight with solder. Over the thread of the tap on the under side of the lid is fitted a small brass bracket cut from brass sheet. This bracket carries a capsule of fine brass gauze, containing some 0.25 grm. of fine asbestos wool impregnated with 10 per cent palladium chloride. The cultures are placed in the tin and the gauze is heated in the Bunsen and the lid fixed rapidly to the tin. Hydrogen is passed in which, combining with the oxygen under the influence of the palladium creates a negative pressure, thus sucking in more hydrogen. The action continues till no more oxygen is left, which takes about fifteen minutes. Surface growths of such difficult organisms as tetanus, malignant œdema and botulinus can be obtained with ease with the apparatus.—J. McIntosh and P. Fildes, *Medical Research Committee, Report Series, No. 12.* (*D. G.*)

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The Value of the Wassermann Reaction.—The value of the reaction in diagnosing undoubted syphilis is shown by the fact that the reaction is positive in practically 100 per cent of the cases of florid syphilis. In active tertiary syphilis of the skin and bones the reaction is positive in about 94 per cent of the cases. As a means of corroborating syphilitic infection, the Wassermann test is at least 90 per cent dependable, as shown in a series of positive reactions in which 90 per cent could be accounted for by syphilitic changes in the aorta alone. The value

of a negative reaction has been studied and its reliability confirmed by the negative reactions obtained in nonsyphilitic affections of the skin.—John H. Larkin, I. J. Levy and John A. Fordyce, *Jour. Am. Med. Assoc.*, 70, *1589 (1918)*.

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Improved Technic for Cultivating the Streptococcus.—The characteristic chains appear earlier and more certainly when Sacquepee's sodium albumin is added to ordinary bouillon. This is prepared by mixing white of egg with three times its volume of distilled water. Five cc. of a 10 per cent sodium hydrate solution is added to 1,000 cc. of the mixture. Distribute in tubes and sterilize at 110° C. for 20 seconds. One part mixed with four parts of plain bouillon is put up in tubes. About 0.5 cc. of the fluid is inoculated with 3 or 5 platinum loops of pus or serous fluid. Incubate and examine under the microscope after three to six hours. In 90 per cent of the cases a diagnosis can be made after six hours.—L. Ramond and L. Postina, *Bull. de la Soc. Med. des Hopitaux, Paris, 42, 142 (1918)*.

✱

Identification of B. Tetani by Serological Reactions.—One of the great obstacles to be overcome in any systematic study of the B. tetani was that the methods hitherto employed for isolating it have proved inadequate for dealing with numbers of strains of the organism. The ideal medium for the isolation of the B. Tetani would be a fluid medium which favoured the growth of that organism whilst restraining the growth of other anaerobic bacteria commonly found in wounds. From numerous experiments the author suggests the following medium: To one pound of chopped meat, a litre of water is added and the mixture is then boiled for thirty minutes. It is then cooled to 45° C. and the reaction adjusted so that it is slightly alkaline to litmus. It is then trypsinized as for the preparation of Douglas' broth and then incubated in an open vessel for five days at 37° C. The putrid product is then filtered through paper and sodium formate is added up to 1 per cent. The reaction is then adjusted to the neutral point for phenol-phthalein and the fluid filtered through a Berkefeld and a Doulton filter in series and is then stored under paraffin in a sterile flask. Before use, each 10 cc. is enriched by the addition of a small piece of fresh sterile rabbit-kidney. Working with such a medium the writer examined a number of different strains and tested their agglutination reactions. As a result of these researches he considers that there are at least three serological types of the B. tetani, and further that in cases of tetanus among the wounded in this country the causal bacilli do not appear to correspond serologically with the type commonly employed for the preparation of antitoxin. On the other hand in some strains of the B. tetani isolated from wounds in men who showed no evidence of tetanus, the predominant type of organism corresponds to the type used for antitoxin formation.—Capt. W. J. Tullock, *Jour. Royal Army Med. Corps, xxix, No. 6.*

(*D. G.*)

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A Simplified Endo Agar.—The composition of the medium is as follows:

Distilled water, 1,000 cc.

Peptone (Difco), 10 grams.

Dipotassium phosphate, 2 to 5 grams.

Agar, 15 to 30 grams.

Boil until dissolved. Do not adjust reaction. Place in flasks and sterilize in autoclave. Previous to use add the following ingredients to each 100 cc. of medium:

20 per cent lactose solution, 1 gram or 5 cc.

10 per cent alcoh. sol. basic fuchsin, 0.5 cc.

Freshly prepared 10 per cent sodium sulphite sol., 2.5 cc.

Members of the colon-typhoid group are quite easily differentiated on this medium. B. coli is deep red with a metallic luster, B. aerogenes is lighter red with no metallic luster, while B. typhosus and B. paratyphosus are transparent, colorless, or slightly amber in appearance.—Max Levine, *Proc. Soc. Am. Bact., Dec. 1918.*

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Quantitative Agglutinin Fluctuations After U. S. Army Triple Typhoid Vaccination.—The reactions after the triple vaccination are negligible when compared with the results derived. Specific agglutinins are produced for each of the three organisms used. The para-B responds comparatively sluggish. The specific agglutinins do not rise to equal heights, but very noticeably in individuals. There is no relation between local and systemic reaction and agglutinin production.—E. A. Fennel, *Proc. Soc. Am. Bact., Dec. 1918.*

A Study of the Antiseptic Properties of Certain Organic Compounds.—The paper is the result of a study of the inhibitive effect of anilin and of the triphenyl-methane dyes on certain bacteria. The higher the concentration of peptone in the medium the lower the effective concentration of the dye. The increase in the number of alkyl radicles increases the antiseptic power. Methyl green proved to be an exception to this rule. The antiseptic power is enhanced to a greater extent by an ethyl than a methyl group. The simple anilin derivatives, as well as the dyes, are more toxic for the Gram-positive than the Gram-negative bacteria.—I. J. Kligler, *Proc. Soc. Am. Bact., Dec. 1918.*

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Recovering Dysentery Bacilli from Stools.—The experience of the authors in the eastern Mediterranean and in Egypt in 1915 and 1916 showed that the chance of recovering dysentery bacilli from the stools was, after the first few days of the disease, a small one. The technic and percentage of positive results are given. The chance of recovering dysentery bacilli diminishes rapidly after the first few days. This appeared to be the case whether the stools remained characteristically dysenteric or not. This places a serious limit on the value of a bacteriologic examination.—C. J. Martin and F. E. Williams, *Brit. Med. Jour., 1, No. 2990, p. 447 (1918).*

✠

Simple Methods for Prolonging the Viability of Meningococcus Cultures.—The uncertainty of maintaining cultures on blood agar, starch agar, and sheep serum glucose agar slants led to an attempt to find a simple, stable medium in which the organisms might be kept alive with less difficulty. This has been accomplished by the use of various deep mediums, especially beef brain. The author was led to test the viability of meningococci in sterile brain by the apparent affinity of these organisms for nervous tissue. In addition to deep brain, a deep blood medium was also used. To obtain cultures for serologic work, it is preferable to subplant from the brain medium on to blood agar slants, incubate twenty-four hours, and subplant from these slants to fresh blood agar to secure suspensions of organisms free from brain. The brain medium is easier to prepare than the blood medium. The work has as yet not been concluded. Brain cultures remain alive for many days at lower temperatures but the viability is higher at 37° C. —Dolores E. Bradley, *Jour. Am. Med. Assoc., 70, 1816 (1918).*

✠

Reduced Eosin as A Reagent.—Reduced eosin in strongly alkaline medium is regarded as preferable to Goldemberg's reagent containing reduced eosin in very slightly alkaline solution insofar as its use as a reagent for investigation of blood spots is concerned; a pronounced greenish fluorescence (similar to that of fluorescein) is obtained with a strongly alkaline medium and thus greatly increases the sensitiveness of the reagent, since the fluorescence is much more apparent than the coloration in dilute solutions. In this manner it was possible to detect 0.00025 cc. of blood in 1 liter of water.—Luciano P. J. Palet and Amancio Fernandez, *Anales socsquim. Argentina, 5, 119 (1917); Chem. Abst., 12, 1201 (1918).*

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Differentiation of Typhoid and Paratyphoid.—Typhoid and paratyphoid A and B can be differentiated by means of a medium consisting of a 3 per cent agar containing 1 per cent of inositol and 1 per cent dextrin, using litmus as an indicator. The dextrin must be one of the lower dextrins. The typhoid ferments the dextrin, with acid formation in the butt of the tube, decolorizing entirely in twenty-four hours with a violet slant. Paratyphoid A does not ferment either dextrin or inositol and so the butt and slant of tube both remain violet in color. Paratyphoid B ferments inositol with gas formation and so paratyphoid B decolorizes the butt of the tube with the formation of gas bubbles, while the slant remains violet in color.—Florence Hulton-Frankel and Katherine MacDonald, *Proc. Soc. Exp. Biol. Med., 15, 31 (1917); Chem. Abst., 12, 1202 (1918).*

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Water Analysis in the Field.—An application of Leighton's tablet methods (U. S. Geol. Surv. W. S. Paper 151) to the proximate analysis of waters. Some modifications have been introduced.—G. W. Heise and A. S. Behrman, *Philippine Jour. Sci., 13 A. 1.*